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COGNITIVE CONSTRAINTS AND SITUATIONAL FACTORS

AFFECTING SPEECH AND WRITING

by

Kirsten Nielsen
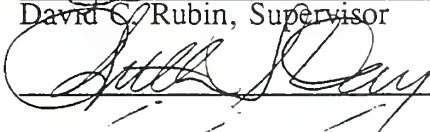
Department of Experimental Psychology
Duke University

Date: _10/13/92_

Approved:

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David C. Rubin, Supervisor

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Dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in the Department
of Experimental Psychology in the Graduate
School of Duke University.

1992

ABSTRACT

(Psychology-Cognitive)

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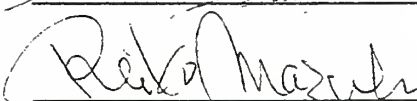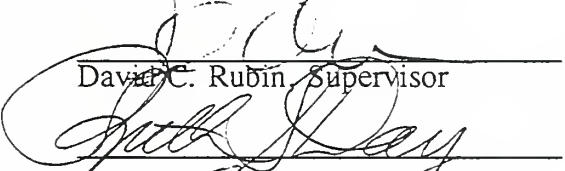
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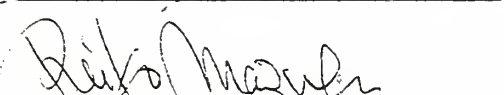
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ABSTRACT

In three studies, the effects of cognitive and stylistic factors on syntax were evaluated, and the relationship of syntax and content was explored. Undergraduates wrote or spoke in a between-groups design under conditions that controlled time, number of words uttered, topic, audience and purpose. Measures of syntax and content were taken.

In Study 1, subjects either wrote for 30 minutes, spoke for 30 minutes or spoke for 5 minutes. The different combinations of mode and time equated either production time or total number of words produced in speech vs. writing.

In addition, subjects did or did not have a pre-production planning period. Most mode effects on syntax typically found in the literature were confirmed under these controlled conditions. Content measures showed that writers produced more ideas per words uttered, whereas speakers produced more ideas per unit production time. Planning influenced some syntactic variables as well, but had no effect on content measures.

In study 2, some subjects wrote in a window in a cardboard sleeve, which did not allow them to review their output beyond the current phrase. When compared to the 5-minute Spoken and the Written groups (with No Plan) from Study 1, Window writers used less conjoining than regular Writers, but no other significant syntax differences were found. Content was not affected.

In Study 3, subjects tried to mimic speech if they were writing or to mimic writing if they were speaking. This manipulation produced changes on most variables relative to baseline writing and speech, with speakers mostly responsible for the changes. Writers in this condition reduced their per-words efficiency.

Findings are interpreted in light of the predictions in the literature on cognitive and stylistic effects on syntax. The notion of a litero-centric bias in studies of speech and writing is examined. It is concluded that mode differences in syntax are more than an artifact of confounding typical production circumstances and mode. The value of systematic manipulation and control in exploring this area is discussed.

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No one works in a vacuum, and my work has been variously influenced, supported, and encouraged by a number of people along the way.

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INTRODUCTION

Speech and writing differ from one another in regular ways. This observation has been made from the time of Aristotle, and more recently has been confirmed by research as varied as naturalistic studies comparing extreme examples of language in the two modes and laboratory studies of speech and writing produced under similar conditions.

Recent studies of speech and writing are remarkably consistent in their findings, despite the fact that the methods and types of analyses have varied. Many studies did not control for one or more important factors, such as amount of time spent producing language, amount of time to plan, or topic discussed (e.g., Chafe, 1982; Chafe & Danielowicz, 1987; DeVito, 1966; Drieman, 1962a, O'Donnel 1974). Others had tighter control (e.g., Portnoy, 1973; Redeker, 1984).

Despite the variety of procedures for arriving at conclusions about speech and writing, the studies converge on a number of consistent differences in the syntax and word use of speech and writing (but see Blankenship, 1962). Generally, under the *most typical*[1] conditions of speech and writing, the following statements summarize a number of the differences found: Speakers use more coordination, inexplicit third person reference, hedges, words of one syllable, colloquial vocabulary, contractions, quotes, responses to questions, first person pronouns, and indices of personal reference. Writers use more attributive adjectives, complement clauses, conjoining, nominalizations, passive voice, prepositions and sequences of prepositions, relative clauses, lists of items in a series, and syllables per word. Writers also show a higher type-token ratio (the ratio of unique words to total words in an utterance) than do speakers. For a definition of the syntactic terms shown above, see Appendix A.

In addition to the noted syntactic differences, speech and writing differ in communicative efficiency: speakers express more ideas per unit time, but writers express more ideas per word uttered (Horowitz & Berkowitz, 1964; Horowitz & Newman, 1964; Higgins, 1978).

On the basis of the observed syntactic, lexical and semantic differences, one may generalize that for the most typical cases of speech and writing, speech is more fragmented, concrete, redundant, involved with the audience, limited in vocabulary, anchored to present context, quickly produced, and (usually) informal. Writing, on the other hand, is more coherent, abstract, efficient in expression, distanced from the audience, rich in vocabulary, freed from the immediate context, slowly produced, and (usually) formal.

In this dissertation, I intend to explore the notion that the observed differences in the syntax and word use of speech and writing result from combinations of two major categories of causes, differing cognitive constraints on speakers and writers, and differing choices in the style of the language used. I will relate my findings on syntax to a set of findings about content expressed, and I will also relate the syntax and content findings to the theoretical question of whether an oral-written continuum has any explanatory power or whether it is just an artifact of confounded situational and cognitive effects.

Chafe and Danielowicz on differences between speech and writing.

The distinction between style and cognitive constraints is not a new one. Chafe (1982) formally introduced the notion, and Chafe & Danielowicz (1987) followed up on it (though others have hinted at the idea; see e.g., DeVito, 1966; Drieman, 1962a; 1962b; O'Donnel, 1974). Chafe and Danielowicz developed the idea of differing cognitive constraints ("processing constraints") and situational

constraints ("formality," or "involvement") in their study of published papers (formal writing), letters to friends (informal writing), classroom lectures (formal speech) and dinner table conversations (informal speech) which they collected from faculty and graduate student volunteers. Samples used in the study were composed of at least 100 intonation units (roughly a clause) from each subject for each language type. Chafe and Danielowicz found that the occurrence of certain constructions in these samples of speech and writing sometimes depended solely on mode, at other times varied with the particular aspects of the situation in which the language was produced, and sometimes seemed to be influenced by both mode and situation.

Chafe and Danielowicz are linguists and not psychologists, so they do no significance tests nor do they use the language of inferential statistics. Without statistics, it is difficult to tell if the main effects and/or interactions in Chafe and Danielowicz's data are reliable or not. However, Chafe and Danielowicz suggest that the variables with a mode effect (my term), that is, those that vary only with mode and not with formality, are those that are mostly out of the communicator's control, affected by cognitive processing constraints alone. Those with a situation effect (again my term) may be selected at will by the communicator. The variables with what looks like two main effects or an interaction seem to be affected both by cognitive constraints and by the choices of the speaker/writer.

In the area of processing constraints, writers are seen to have the upper hand in producing clear discourse. Clear discourse in this case refers to a discourse with few dysfluencies, much variety in vocabulary, fewer words to make a point, and elaborate though comprehensible syntax. Processing constraints impinging upon communicators include time (writers have more of it, even on a single pass through

a composition), editing (writers can edit invisibly, while speakers cannot), and cognitive capacity (writers are less dependent on the capacity of working memory while writing because they can look back at their discourse and change it; speakers must keep the current clause, and the overall topic organization, in memory). Constructions affected solely by processing constraints, according to Chafe and Danielowicz (1987), include inexplicit third person references, type-token ratio, hedges (i.e., "sort of," "kind of"), coordination, relative clauses (from Chafe 1982 only), and length of intonation units.

Unlike the constructions affected by processing constraints, constructions affected by situational factors vary more with the location and composition of the audience, with the topic, and with the purpose of the discourse than they do with mode. The various constructions that seem to be affected by situation are thus freely chosen by communicators, rather than pre-determined by the cognitive constraints that may otherwise influence the structure of communication. These constructions include contractions, passive voice, literary and colloquial vocabulary, use of "you know", first person pronouns, responses to questions, adverbial expressions, abstract subjects, and indications of probability (such as "probably", "usually", etc.).

Chafe and Danielowicz also allow for a third set of constructions that, to an extent, can be chosen by communicators to suit situational factors, but that also are limited by cognitive constraints. As they say, "None of these devices is cognitively difficult, but combining them in quantity evidently requires the extra time and care available to a writer" (p.102). Into this category fall prepositional phrases and sequences of prepositional phrases, nominalizations, conjoining, attributive adjectives and nouns, and participles.

It is important to note that Chafe and Danielowicz's conclusions about the causes of differences in the four types of speech and writing that they studied, while an excellent start, are based only on natural variation and not on systematic manipulation of the factors to which they attribute the differences. An approach that manipulates the hypothesized factors systematically would provide even better evidence for the etiologies of the various kinds of linguistic form that differ between speech and writing.

Other studies of differences between speech and writing

Others besides Chafe and Danielowicz have noted significant differences in the syntax and word use in speech and writing.

In a within-subjects design, Gibson, Gruner, Kibler, and Kelly (1944) compared the speech and writing of speech students on topics that varied between subjects, but were the same within subjects. Gibson et al. found that spoken style was more readable, more interesting, and contained a simpler vocabulary than written language. The written sample contained longer sentences and words with more syllables and had a higher type-token ratio.

Drieman's (1962a) word-count study comparing oral interview responses to written papers, found that writing, as compared to speaking, offered shorter texts, longer words, words of more syllables and fewer words of one syllable, more attributive adjectives and a more varied vocabulary (reflected by type-token ratio). Drieman also made the important argument that, to understand language use, entire texts must be used. Texts of different lengths may imply various cognitive sets on the part of communicators, and individual parts of texts may not be representative of texts in their entirety on many dimensions.

A few flaws in Drieman's study should be noted. Drieman's type-token

ratios were calculated on samples of unequal lengths, making them essentially
uninterpretable because of the sensitivity of type-token ratio to sample length. In
addition, Drieman did not control for production time, nor can one be certain that
speech produced in an interview should be compared to writing produced
presumably without prompting or questions.

In a second study, Drieman (1962b) asked subjects what the main
differences were between speaking and writing. Drieman reports that the subjects
talked about two main features of writing which differed from speech. Subjects
reported that writers are more concise, choosing their words carefully, and that
writers have more than one chance to say what they intend.

Drieman argues that the subjective observations of his subjects in the
qualitative study were confirmed by the objective word frequency data of the
quantitative study (1962a). Shorter texts, longer words and varied vocabulary result
from careful word choice. The frequent use of attributive adjectives in writing
results from precision of expression, as writers use "more qualitative gradations."
Emphasis on precision and conciseness constitutes the main difference between
speech and writing. Thus, Drieman implies that the difference between speech and
writing in speed of production and in the ability to revise allows for differences in
the structure of the product.

Blankenship (1962) compared the public speeches and the writings of four
speaker-writers and found greater differences in style and syntax among the four
subjects than between the two discourse modes. Furthermore, what differences she
did find between speech and writing were often in different directions for individual
subjects. Her one robust difference was that there were about twice as many
passive constructions in writing as in speech. She concluded that "syntactical

structure is determined by an individual's style rather than read/heard purpose. This suggests that dimensions other than 'written'/'oral' be sought when discussing style."

Blankenship's findings can probably be explained in light of her small sample size and her choice of spoken sample type. With a sample size of four, individual differences are likely to overpower any treatment differences that might exist. This is particularly true of language production, where variability is especially high. Furthermore, Blankenship's choice of spoken sample was poor, as she compared public speeches, which are frequently written out and read, to writing.

Horowitz and Newman (1964), in a within-subjects study that controlled the circumstances of production relatively well, asked subjects to speak for two minutes and also to write for either two, four, six, eight, ten, or twelve minutes on two balanced topics. They found that subjects produced in two minutes of speech more major ideas, subordinate ideas (i.e., expansions or elaborations), ancillary (i.e., irrelevant) ideas and communicative signals ("a linguistic introduction to the expression of an idea" (p. 642)) than they did in writing at total times up to six minutes. After six minutes of writing, the difference in ideas communicated in speech in two minutes versus writing in eight, ten, or twelve minutes was not reliable. Type-token ratio was also measured (on samples of variable length), and it was found that writing always yielded higher type-token ratios than speech, regardless of the time spent writing.

Horowitz and Newman's study has many problems. The authors each categorized independently the content of the samples, making changes by discussion if necessary, but they report no inter-rater reliability. In addition, the authors used

multiple t-tests to compare the values for three separate content variables (one of which was a composite containing the other two) in each adjacent written time period to the spoken condition. No ANOVA was done, but a total of 15 t-tests were performed without any type of alpha control. Horowitz and Newman did likewise with their type-token ratio data, comparing the numbers of types, tokens, and the ratio in each written time condition to the spoken condition, for a total of 15 more unprotected t-tests. Furthermore, as noted before, the use of type-token ratios with varying sample sizes is problematic.

Horowitz and Berkowitz (1964) did a similar study to that of Horowitz and Newman (1964), this time comparing speakers to writers, typists, and stenotypists. All four groups produced similarly sized samples, with group means between 218 and 238 words. Typists and hand-writers did not differ reliably in the amount of time taken to produce this amount of material, whereas stenotypists differed reliably from both writers and typists on this measure.

In an analysis looking at the whole samples, there were no differences between groups on any of the idea measures used in Horowitz and Newman (1964). However, as a function of time (ideas/(seconds X 100)), speakers produced more of each idea measure than any writing group. Type-token ratio was significantly lower for speakers than for any written group except stenotypists. As in the Horowitz and Newman study, Horowitz and Berkowitz conducted no ANOVAs, only multiple unprotected t-tests, and they had no measure of inter-rater reliability.

DeVito (1966) studied oral interviews and published papers of ten faculty and graduate students. Topic was controlled within-subjects, but not across subjects. In this analysis, DeVito found that the spoken discourse contained more words of self-reference, more "pseudo-qualifying terms" (e.g., quite, very, most),

more "allness terms" (e.g., none, all, never), more qualification terms (e.g., however, but, except) and more terms "indicative of consciousness of projection" (e.g., seems, to me, appears).

DeVito attributes the differences to various causes. Stylistic choice, according to DeVito, is responsible for the differences in words of self-reference, pseudo-qualifying terms, allness terms, and terms indicative of consciousness of projection. The personal or impersonal nature of a topic may also contribute to the greater number of words of self-reference. On the other hand, DeVito implies that cognitive factors influence the prevalence of qualification terms in speech, however, as those terms are used as filler words while speakers think about what to say next. Writers, on the other hand have less need to qualify their statements in the first place, he says, because they have the luxury of selecting more precise wording.

O'Donnel (1974) used as a sample newspaper articles and a transcript of a television interview from one subject, who was a scholar, author, lecturer, television host and editor. The topics of the sample were an "expression of ideas on a variety of topics of general concern." O'Donnel's data were first divided into T-units (for minimal terminable syntactic unit). A T-unit consists of an independent clause and the dependent clauses syntactically related to it.

O'Donnel selected a sample of 100 T-units from the spoken and the written corpora. Within each sample, he counted the total number of words, the number of clauses, passives, auxiliaries, nonfinite verbals, and attributive adjectives. His sample of speech contained fewer words than the sample of writing, but this is an artifact of the collection procedure. T-units in the writing sample were longer than those of speech. Since O'Donnel collected an equal number of T-units in the two modes, his writing samples naturally had more total words.

Writing contained more dependent clauses, gerunds, participles, attributive adjectives, passive constructions, modal auxiliaries, and perfective auxiliaries than did speech. Speech contained more noun clauses, infinitives and progressive auxiliaries. The author attributes greater T-unit length to the syntactic density of writing. Syntactic density, also called "compactness," means that much information is squeezed into the smallest possible syntactic unit in writing. O'Donnel does not, however, suggest any reasons why writing takes on this compact character, nor why the other variables turn out as they do.

O'Donnel cautions appropriately that the results of his study are only minimally generalizable because he used only one subject. He emphasizes the importance of using some unit of analysis other than a sentence, because it is essentially impossible to define a spoken sentence; furthermore, even the division of writing into sentences in English is arbitrary and depends on the personal tastes of the writer.

Portnoy (1973) used samples of speech and writing of equal length (using the first 219 words of each subject's utterances) in a within-subjects examination of syntax and comprehensiblity in the two modes. She found that writers had larger type-token ratios, suggesting more diverse vocabulary. Speakers showed more word redundancy, more conjunctions, more contractions, and more auxiliary verbs. There were no differences in any other set of syntactic variables she measured. Portnoy's significant findings are difficult to interpret, however, as she performed at least 18 separate paired-difference t-tests, without benefit of any omnibus test, nor any adjustment to alpha. Thus we should expect one of her findings to be significant at the $p < .05$ level purely by chance (since 1 out of 18 is close to the five percent of findings attributable to chance at an alpha of .05).

Portnoy also measured comprehensibility, using the Cloze procedure to investigate to what extent others could guess the deleted words from the original subjects' oral and written passages. Based either on a strict criterion in which the Cloze subject's response must exactly match the word deleted from the passage or on a looser criterion in which the response must only match the grammatical class of the missing word, there were no systematic differences in comprehensibility by mode; some subjects' written passages were more comprehensible, while other subjects' spoken passages were more comprehensible.

Poole and Field (1976) compared the speech and writing of incoming college students. The speech samples consisted of a structured interview about university life, while the written samples were essays about what students forecast they would be doing for the rest of their lives.

Using indices derived from an earlier factor analysis, Poole and Field concluded that spoken language is more complex than written. This conclusion was based on findings for indices constructed from various combinations of verbs and other grammatical structures that are more frequent in speech, and from such characteristics as sentence length and pre-verb length. Poole and Field attribute the finding to the greater time a writer has to plan the structure of the discourse, thus making writing structurally less complex. Speakers have less time to "sift" their verbal output. Interestingly, other authors (e.g. Chafe, Drieman, DeVito) have made the same "sifting" argument for writing's being more, rather than less, complex, saying that writers have time to pack more information into a syntactic unit. Perhaps complexity is a term to avoid since its definition varies depending on the researcher (see, for example, Beaman, 1984). A better approach would be to count structures which can be defined objectively (e.g., types of subordination).

Whether subordination, or any other syntactic structure, is simple or complex cannot be an issue in the absence of a theory of complexity.

Poole and Field found, like DeVito, that writing contains more adjectival elaborations. Speech, on the other hand contains more adverbial elaborations. The authors speculate that the different trends in the frequency of occurrence of these two kinds of elaboration could reflect several underlying causes: a) an emphasis on precision in writing, b) the centering of speech in a current context, and, c) because of (b), the greater frequency of action verbs in speaking.

Poole and Field found that writers use more complex verb structures. They define complexity of verb structure as pre-verb length (longer is more complex) and use of passives. Poole and Field explain that pre-verb length is greater in writing largely because of stylistic considerations (such as avoiding the repetitive use of a particular sentence structure). They argue that the greater frequency of the passive voice in writing comes from the ability of writers to overcome capacity limitations through extra time for "encoding and the opportunity for recoding." Poole and Field see capacity is an issue because earlier studies (Harwood, 1959 and Miller, 1962) suggest that passive voice is a complex transformation, requiring more capacity. This is the opposite position of Chafe (1982) and Chafe and Danielowicz (1987), who say that passive constructions are easy to use, but that they lend themselves best to abstract topics.

In Poole and Field's data, there were significantly more indices of personal reference used in speech than in writing. Because the topics were both very personal, Poole and Field suggest that it is the presence of an immediate audience, rather than the topic being discussed, that is responsible for the difference.

Redeker (1984) studied the explanatory and narrative speech and writing of

eight subjects, on four related topics. She was with the subjects in the room during the spoken sessions, and subjects were to talk as if in casual conversation. Redeker limited her reactions to "only nonverbal (i.e., gaze, mimic, posture, etc.) back-channel responses to avoid the essentially uncontrollable influence of verbal reactions on the subject's lexical and syntactic choices" (Redeker, 1984, p. 46). Of course, this procedure did not avoid the problem of experimenter influence, as even nonverbal responses can influence the behavior of the subject.

The written samples in Redeker's study were in the form of a letter to the experimenter, and thus both conditions were to use informal language. No prior planning was allowed for speakers or writers.

Redeker does not mention if she controlled for production time (by setting a maximum time). Her spoken presentations varied between 3 and 11.25 minutes, for a range of 570 to 1933 words. Her writing sample ranged between 166 and 545 words.

Redeker subjected the data to a series of analyses of variance, with genre and modality as repeated factors and Chafe's involvement, detachment, integration and fragmentation scales as dependent measures. The scores on the scales were the frequencies of Chafe's (1982) syntactic types for that category. The frequencies for individual variables making up the scales were not all in the expected direction for mode or genre, but they generally confirmed Chafe's naturalistic findings. In addition, the overall scale scores clearly supported Chafe's contention that speech is more involved and fragmented than writing.

The involvement, fragmentation and integration scales all showed significant effects of modality, with speech being more involved, less fragmented, and less integrated than writing. There was no significant effect of modality on detachment.

There was also a significant effect of genre on involvement and on integration, but not on fragmentation or detachment. Thus Redeker's findings lend some experimental support to Chafe's post-hoc categories of integration/fragmentation and detachment/involvement.

Other views on the oral-written dichotomy

Biber (1986) has taken a non-experimental, quantitative multivariate approach to the dimensions which underlie various forms of language. He subjected the distribution of 545 text samples of 2000 words each, from corpora of spoken and written English, to a factor analysis using Promax rotation. His 41 features came from the work of Chafe, DeVito, O'Donnel, Blankenship, Poole and Field, and others. The speech samples consisted of face-to-face conversation, telephone conversation, broadcasts, interviews, and planned and spontaneous speeches. The writing samples included press reports, editorial letters, skills and hobbies, popular lore, official documents, academic prose, belles-lettres, general fiction, romantic fiction, and professional letters.

Three factors emerged from the factor analysis: Interactive vs. Edited text, Abstract vs. Situated content and Reported vs. Immediate style. The first factor, Interactive vs. Edited text, represents both of Chafe's (1982) dimensions, involvement/detachment and integration/fragmentation. Some of the cognitive constraints on speech which may cause fragmentation are important only when a speaker is forced to interact with an audience. For example, it would not matter how quickly a person talked if no one were to hear it, but the only time there is no audience to judge one's fluency is in writing. Biber does point out that the interactive (audience present or absent) dimension and the cognitive (output editable after the fact or not) dimension could be analyzed separately. This would be an

important analysis to perform because of the confound of audience location and after-the-fact editability.

Biber's second factor, Abstract vs. situated content, also reflects where the audience is relative to the speaker/writer, but this time the location of the audience does not affect cognitive processing capacity. Instead, the effect of audience location is on the context, topic and referents in the discourse. Thus audience location thus can interact with cognitive constraints (as above) to influence some variables and can also stand alone to influence other variables.

Biber's third factor, Reported vs. immediate style, is a topical dimension. If the topic of a text is a story, one finds past tense, third person pronouns and adjectives. If it is non-narrative of any type, one finds present tense and few third person (gender-marked) pronouns. Most studies have ignored this distinction because the researchers chose a non-narrative genre (but see Redeker, 1984). Others, like Chafe (1982) and Chafe and Danielowicz (1987) have included both narrative and non-narrative in their samples because of their choices of discourse types. Chafe (1982) and Chafe and Danielowicz (1987) were generally not concerned with differences in topic.

Biber suggests that his three dimensions serve as a way to reconcile differences in the literature between counts of such features as subordination (e.g. Chafe (1982) finds more in writing; Poole and Field (1976) find more in speech), or contradictions concerning the general existence of differences in form between speech and writing (Chafe (1982) finds differences, using conversation and academic prose; Blankenship (1965) does not find any, using public speeches and journal articles). According to Biber, Chafe's (1982) use of conversation and academic prose puts his samples at extremes of two of the three factors, while

Blankenship's choices put her samples close together on two of them. Of course, it is possible to attribute Blankenship's findings to other problems, such as her small sample size.

Biber suggests that types of speech and writing lie in a three-dimensional space and that speech and writing are not of themselves two distinct forms of language. Rather, he argues that his three dimensions represent the natural variation in language forms better than a spoken/written dimension can. But a spoken/written dimension may still be a valid one when speech and writing are produced under similar, controlled conditions, which Biber's naturally-occurring samples were not. Biber's work points to variables, such as topic and production context, which need to be controlled in order to maximize the possibility that any true mode differences will emerge. If his contention that speech and writing are not different forms of language were true, then it would be possible for speakers to precisely mimic writers and vice versa, such that speech that mimics writing would be indistinguishable from writing, and writing that mimics speech would be indistinguishable from speech.

Others besides Biber have also recently made the argument that spoken vs. written is not the dimension that ought to be investigated in order to explain variations in linguistic form. Chafe and Tannen (1987), in a review of the speech and writing literature, came to the conclusion that because "there is no single feature or dimension that distinguishes all of speech from all of writing" (p. 391), one should not look to the "oral-literate dichotomy as a determiner of linguistic form" (p. 394) but rather one should be concerned with "oral and literate strategies" that reflect "relative focus on involvement" (p. 394). Tannen makes this point in her article on oral and written narrative, as well (Tannen, 1982).

Rubin (1980), in her review of oral-written differences and their relationship with the task of children learning to read, argues similarly that the mode difference is not the overriding factor distinguishing speech and writing. She says,

> it is misleading to compare the broad class 'oral language' with all 'written language,' because differences within these classes can be much greater than any general distinction between them. In fact the simple oral vs. written dichotomy on which much research has focused corresponds to only **one** of several dimensions of language experience (p. 412).

Thus according to these views, it appears, mode differences are only an artifact of confounded situational effects like topic, audience, and purpose. However, there is some support for the notion that mode differences may in part reflect underlying cognitive factors, which cannot be, under normal circumstances, separated from mode. For example, there is evidence from studies of brain-lesioned patients that at least some aspects of speaking and writing may be separated by mode at the neurological level. Some brain-lesioned people show dissociations in which either the spoken or written mode of either production or comprehension is unilaterally impaired. Such data have led researchers such as Morton and Patterson (1980), Caramazza (1988), and Caramazza and Hillis (1990) to postulate models of the lexicon, one important part of an overall language processing system, that include separate orthographic and phonological input and output areas.

So is there a valid distinction between linguistic forms that is based on mode of production, or are such apparent 'mode' differences merely artifacts of confounded situational variables? It is difficult to know this from the combination of studies reviewed so far, but the experiments to follow should shed some light on the matter. I will argue that mode itself, while confounded with situational factors, is an important component to differences in oral and written linguistic form,

inasmuch as mode carries with it certain cognitive consequences that are independent of some (though not all) social factors. In order to understand the relationship between mode, cognitive constraints, and situational factors, one needs first to define the functional differences that lead both to cognitive constraints and to situational influences on linguistic form.

The functional sources of cognitive and stylistic effects on linguistic form

As we have seen, it may be possible to divide the underlying causes of syntactic differences between speech and writing into those affected mainly by cognitive constraints, those affected mainly by stylistic demands imposed by the situation in which the discourse takes place, and those that are affected by both kinds of constraints. These factors are not always independent of one another. I will now consider what the particular production circumstances are that contribute to the categories of cognitive and stylistic effects.

Cognitive constraints. One potential source of syntactic differences in speech and writing is different constraints on cognitive processing. The production circumstances that probably contribute to cognitive processing constraints are permanence of the output as a public record (or not), editability (or lack thereof) of the output before presentation to the intended audience, speed of production of the output, location of the audience, and the relative effort, physically and mentally, of producing one form of language or the other. I now consider each of these factors in the order in which they are presented in Table 1.

Product Permanence. A speaker's output is present only while the speech is being produced, and then the output disappears. Unless the speech is recorded, it is difficult to prove exactly what was said. Thus speakers may be allowed to be imprecise in their expression, while writers, aware that their productions may

Table 1

Production factors with cognitive consequences for speech and writing.

	Mode	
	SPEECH <---------------------------------> WRITING	
Product Permanence	Transient no permanent record of language can be less precise	Permanent permanent record of language must be precise
Review and Editability	Editing obvious corrections hard cannot review whole discourse rely on memory time memory	Editing invisible corrections easy can review whole discourse can look back spatial memory
Physical Effort	Easy can waste words	Difficult avoid wasting words
Mental Effort	Demanding some syntax difficult	Less demanding most syntax easy
Audience Location	Nearby interesting silence avoidance holding floor react to audience shared context	Far away boring silence unimportant holding floor unnecessary predict audience context not shared
Speed	Faster less time for: planning lexical access STM access LTM access syntax formation product delivery immediate	Slower more time for: planning lexical access STM access LTM access syntax formation product delivery delayed

endure indefinitely, may feel compelled to choose their words more carefully.

The permanence of writing also allows writers to use a spatial metaphor for remembering the text. It has been demonstrated that people reading a page of text can recall where on the page an idea or phrase was found (e.g., Zechmeister & McKillip, 1972; Zechmeister, McKillip, Pasco, & Bespalec, 1975; Rothkopf, 1971). The same should be true of writers producing text. Speakers, on the other hand, must rely on their memory of time and the order of events to know when or whether something was said.

Review and Editability. The permanence (or transience) of the output of language production is also related to the communicator's ability to review and/or edit the discourse before the audience receives it. This has cognitive consequences. The presence of the entire document relieves writers of a memory load with which speakers must contend. Speakers can plan as much as they can later remember, but they cannot revise an utterance, or certainly an entire discourse, once uttered. Writers, however, can always look back to see what they have written, and thus can revise more easily.

Physical effort. Writing takes longer, is physically more difficult, and is more time consuming than speaking (Horowitz & Berkowitz, 1964). Writers attend more closely to prescriptive rules of discourse (possibly in part because of the permanence of the product); this requires effort. Writers also face the limitation that it is more physically demanding to take pen to paper or fingers to keyboard than simply to speak. Thus there is a greater cost to impatient writers for the expression of tangential or extraneous ideas.

Mental effort. Because of the many demands on speakers, such as speeded production and memory load, it has been proposed (by, e.g., Chafe) that it is more

difficult to produce certain syntactic structures online (in spontaneous speech) than in writing. Specifically, it may be more difficult for speakers to produce constructions like relative clauses, leading them to favor instead additive constructions, like coordination.

Audience Location. Generally, the writer's audience is far away while the speaker's is nearby (Chafe, 1982). Therefore, writers must predict the ability of the intended audience to understand the discourse more than speakers must. Speakers can change their output mid-stream, reacting to cues the audience gives about relevance, comprehensibility, or other qualities of the current utterance. Speakers share the immediate context with the audience, while writers must instantiate a common context. These factors, also referred to as contextualization and decontextualization (Tannen, 1982; 1983) may be part of what makes writing more specific, explicit, and abstract than speech.

In American culture, audience nearness compels speakers to maintain "the floor," or their turn in the conversation. Long silences are uncomfortable (Tannen, 1984; 1985) and a silence of great length might imply to the listener that the speaker is finished (though, according to Tannen, the length of a tolerable interval may even vary with regional conversational styles in the U.S.).

The tendency in American English to avoid silences may even be present when a speaker is unlikely to be interrupted (e.g., talking alone on a tape) because the habits of more public speech continue despite the lack of an audience that can interrupt. Speakers, with or without competition, often end up uttering sounds with little meaning, like "um" and "uh," "you know," "like," and "I mean." (But see Chafe & Danielowicz, 1987, for another possible explanation for the use of "you know").

Speed. Chafe (1980) estimates that speaking occurs at an average rate of 180 words per minute while writers write at a rate of 18-20 words per minute, at best. Probably writing is as slow as 13 words per minute (Matsuhashi, 1981). Even fast typists (at 60 words per minute), who are at least three times faster than hand writers, are still only one-third as fast as speakers. The immense difference in output speed leads to some processing demands that are particular to speech and writing, especially when combined with the factors of audience presence and physical and mental effort.

Speakers maintain a rapid rate of speech while also worrying about avoiding silences. Therefore, speakers have comparatively limited time for planning the organization of an extended utterance, for accessing ideas from memory, for performing lexical access and for combining retrieved ideas and words into an utterance (syntactic planning). Because the time required to perform these functions adequately may exceed the time available online, a speaker may have access to (a) only a portion of the total vocabulary in the lexicon, and (b) only a fraction of the ideas related to the topic that are in memory. Time constraints combined with the temporary inaccessibility of the appropriate word or phrase may therefore lead speakers to hedge, hesitate or use more words than should be necessary, and thereby contribute to the characteristics commonly seen in speech.

Writers have more (perhaps almost unlimited) time to produce the ideas, words, and grammatical constructions that best convey the intended meaning. If one talks only of the first draft of a writer's discourse, the writer has at least three times longer to produce the intended meaning. Later revision opportunities add to that time.

The writer's speed may also be a disadvantage. If one assumes that there is

a rate of (serial) idea generation and that it is close to the rate of speech (it might even be faster), then writers may be producing ideas at least three to six times faster than the ideas may be written down. Or, if idea generation is more of a parallel process, then ideas would still occur faster than they could be uttered because several ideas could be generated at once. Either way, this speed difference may require a writer to use a buffer system to store ideas until they can be written down, so that they will not be forgotten. Of course writers can always jot down a word or phrase on a note pad to remind themselves later and then return quickly to writing the idea in progress. The audience need never know that this happened. Thus writers have a strategy that will help alleviate in an "invisible" and elegant way the memory problem associated with output of ideas that is too slow. By contrast, speakers' only recourse in dealing with lexical access and idea generation delays is to produce extra words in the intervening time before the appropriate words or ideas come to mind.

The degree to which a discourse can be planned before it must be uttered should have a direct effect on the influence of speeded processing on production. The less time there is to plan a discourse ahead, the more the effects of speeded processing should be exaggerated for speakers, as more and more production processes must occur under the time pressure of producing a discourse rather than ahead of time.

Situational factors. Stylistic differences, those that Chafe and Danielowicz argue probably result from different, willful choices about language use, are likely the result of the communicator's adapting to the appropriate style for the situational factors like the nature of the audience, the purpose of the communication, and the topic of the discourse. For example, just as speaking in slang during a lecture may

Table 2

Situational factors affecting speech and writing.

Situation

EVERYDAY <---------------------------> SPECIALIZED

Audience Composition	Peers less literary language additive syntax more creative vocabulary	Prestigious more literary language embedded syntax less creative vocabulary
Discourse Purpose	Social less literary language more fillers	Professional more literary language fewer fillers
Topic	Concrete concrete vocabulary active syntax	Abstract abstract vocabulary passive syntax

be inappropriate, writing a formal letter to a friend could be seen as insulting. I now consider several situational factors in more detail, in the order in which they appear in Table 2.

Audience composition. One of the factors that can vary independently with speech and writing but affects their form is the composition of the audience. Communicators may wish to make their language more or less formal depending on whom they are addressing. Not only does one want to appear intelligent and knowledgeable in front of a professor, business associate, or other potential judge of one's character, one may also want to appear friendly, fashionable, or empathic to friends, peers or relatives. Thus, to the extent one can, one may pitch one's language, both syntax and vocabulary, to the perceived values of the intended audience.

Audience composition may contribute, for example, to speakers' production of hesitation sounds. Tannen (1985) has suggested that in American culture, speakers who emit few of these sounds in their speech are perceived as untrustworthy, "fast talkers," except under circumstances where fluid speech is expected.

Discourse purpose. Another factor that can influence the choices communicators make about their language use is the purpose of the communication. If the purpose of a communication is to create rapport, as in much conversation (Tannen, 1989), then one set of vocabulary and syntactic constructions might be in order. If the purpose is to transmit information, as in setting forth a contract or promoting a scientific idea, then another, or many other, set(s) of vocabulary and syntactic structures may be appropriate.

Topic. The topic of a discourse also contributes in part to the choices of

vocabulary and syntactic structure to be used by the communicators. Abstract topics call for abstract vocabulary, concrete topics for concrete vocabulary. Abstract topics may also lend themselves particularly well to the use of the passive voice (Chafe & Danielowicz, 1987).

Purpose of this investigation

The preceding review has shown what the differences are, mostly in syntax and to a lesser extent in content, between spoken and written language. The cited studies are largely linguistic investigations carried out under naturalistic conditions. In some cases, causes for observed differences have been suggested by investigators, but none have systematically tested. Thus what is missing in the preceding studies, from a psychologist's point of view, is control of as many factors as possible in the circumstances of production coupled with systematic manipulation of production factors to see what exactly contributes to the differences that traditionally have been observed. In the investigation to follow, a psychological approach is taken, both in the control of situational factors and in systematic manipulation of hypothesized causes of spoken - written differences, isolating such causes as much as possible.

The studies

The studies that follow had several purposes. Study 1 was intended (a) to replicate under controlled conditions the earlier findings in the literature on syntactic differences between speech and writing and (b) to assess the effects of prior planning, and thus cognitive constraints, on speech and writing. The presence or absence of a planning period could affect speakers by influencing the amount of online processing they must do to produce a piece of discourse on a topic. Speakers who have no opportunity to plan prior to their beginning to speak must do all

planning during production of the discourse and thus might show a different pattern in their use of those constructions that seem to be affected by what Chafe calls, generally, a "cognitive processing constraint." Prior planning should not affect writers' final product very much, as any planning they do while producing discourse is ultimately invisible to the audience (the reader).

Study 2 was designed to examine review and editability, one of the constraints on production that may differentially affect the cognitive processes of speakers and writers. By taking away writers' access to their previous utterances, one may increase writers' memory load to a level resembling that of speakers while also.denying them, as speakers are denied, the ability to change their discourse beyond the few words under consideration at any one time (i.e., visible and accessible to the subject). Study 2, like Study 1, asks which variables are not completely under the subjects' immediate willful control, but rather are subject to the cognitive limitations of online processing capacity.

In Study 3 subjects were asked to speak as if they were writing or write as if they were speaking. By deliberately manipulating stylistic choice only, Study 3 asks the inverse question of Study 2, i.e., which variables *are* under willful control?

All studies included an analysis of the content of subjects' data, an analysis that is usually not combined with syntactic analysis in this literature (but see Horowitz and Berkowitz, 1964; Horowitz and Newman, 1964). Content was evaluated to see if the literature's usual syntax-based inferences regarding communicative efficiency are correct and to explore the possible contribution of cognitive and stylistic factors on the content communicated.

The task.

Subjects in all three studies were asked to give an explanation of the game of

basketball to a hypothetical foreign visitor who knows nothing about the sport. Basketball is an ideal topic because (1) Duke students know a great deal about basketball and (2) although the exact form of organization in memory for knowledge of basketball is not known, one can say that the organization is not linear; depending on the perspective of a speaker or the order of events in a game, the order of priority for mentioning different elements of the game might vary. This is contrasted with, for example, a narrative, in which one might assume a more linear ordering exists in memory, based on the order of events in the narrative.

The organization in memory for the topic of a discourse is an important consideration. Writing and speech require linear organization of the output (Levelt, 1989). Any topic that deviates from a linear organization as its likely memory structure should require effort to "linearize" the ideas for language production. This additional effort should help to maximize any observable differences in syntax and organization of speech and writing, compared to what one might find in a more sequentially organized topic like a narrative.

Variables measured in the studies.

Most of the syntactic variables measured in the studies that follow, and the decisions about which conceptual categories to place them in, were derived from the descriptive linguistic literature on differences between speech and writing, but especially from Chafe (1982) and Chafe and Danielowicz (1987). Because there are some disagreements in the literature about which variables are influenced by which factors, I have not placed all variables in exactly the same form or the same categories into which Chafe and Danielowicz would probably place them, but Chafe's studies were clearly the major guiding force.

There are a couple of modifications to Chafe's usual set of variables and likely categories. One variable, hesitations, did not appear very often in the literature comparing speech and writing but was added anyway, in order to supply a manipulation check on both the cognitive and stylistic effects in Studies 1 and 3. In the speech production literature, hesitations are known to increase with cognitive load (e.g., Beattie, 1980; Butterworth, 1975; 1980; Goldman-Eisler, 1961; 1967) and also to be affected by social (i.e., situational) manipulation, such as nonverbal feedback (e.g., Goodwin, 1981). Thus in order for the manipulations in Studies 1 and 3 to have any face validity, they must have an effect on speakers' hesitations. Because of the dual nature of the effects (i.e., both cognitive and social) on hesitations, they are placed in the category of variables affected by a combination of factors, both cognitive and situational. (A complete categorization of all variables in the studies follows shortly).

Another exception to the general set used by Chafe and Danielowicz (1987) and Chafe (1982) is the variable called "filler words." In this variable I include "you know" from Chafe and Danielowicz (1987) along with two other expressions that appear to fill a similar function, "ok," and "like." (See Erman, 1986, for a discussion of possible pragmatic functions of "you know").

A third departure from Chafe's opinions concerns the passive voice. The cause of the differences in use in speech and writing of passive constructions is a matter of some dispute in the literature. Some, like Chafe, attribute differences in distribution to stylistic choice. Others, like Poole and Field, attribute differences purely to cognitive capacity. Because there is no clear category into which this variable should fall, I have taken the liberty of using the middle ground, and I have included passive constructions under combination variables.

The syntactic dependent variables in the studies are shown in Table 3, grouped into categories according to whether their use should be affected mainly by cognitive processing constraints, by stylistic choice, or by both.

The multi-variable methodology used here, unlike methods measuring only one or two dependent variables, is intended to provide a detailed picture of the differences between speech and writing. In addition to the syntactic variables, a set of measures of the semantic content of the data have been included, to test the conclusions about content that some investigators have reached based on syntactic and lexical information alone.

Horowitz and colleagues are, to my knowledge, the only previous researchers who have looked at content in speech and writing (Horowitz and Berkowitz, 1964; Horowitz and Newman, 1964). In both studies, Horowitz and his collaborators combined measures of Type-token Ratio with a general content analysis that rated major ideas, subordinate ideas, and ancillary ideas. There were many problems with these studies, but the notion of combining syntactic and content measures is a good one. To my knowledge, the content measures to be described provide the only direct measurement of the specific content (vs. Horowitz' more general measures) of speech and writing in the literature. Furthermore, this is the first time such measures have been combined with a thorough set of syntactic measures.

The system for scoring the content of the data was derived from the 1985 NCAA rule book for men's basketball (Steitz, 1985) and, in the case of non-rule items, from an examination of a subset of the data. The following measures of content were used: total ideas communicated (similar to Horowitz's major ideas); rules communicated; strategies communicated; and ideas specific to Duke games

Table 3

Syntactic variables organized by cause groups: Cognitive, Situational, or
Combination.

	Cause group	
Cognitive	Situational	Combination
coordination	contractions	nominalizations
informal hedges	1st person pronouns	conjoining
inexplicit 3rd person reference	filler words	attributive adj.
type-token ratio		sequences of prepositions
relative clauses		hesitations
		passives

communicated. Proportions were taken of these to yield the following: ideas per 100 words produced; ideas per five minutes production time; rules per 100 words produced; strategies per 100 words produced; and Duke-specific ideas per 100 words produced.

General Method

The following studies were all a part of one large experiment. With the exceptions noted later for individual studies, all details of the testing of subjects were as described here.

Subjects. Subjects were male undergraduates, recruited from the introductory psychology subject pool or recruited for pay of $5.00/session by flyers posted on campus. In order to participate, subjects must have been through at least several games of Duke basketball (i.e., no fall first-semester freshmen), to ensure that subjects shared a common knowledge base. Subjects were native English speakers.

Subjects were disqualified if they (1) did not produce at least 250 words (2) did not provide at least 10 correct ideas that were on the scoring sheets or (3) had more than a 15% error rate (as rated by the stricter scorer where there was disagreement) for the ideas that they did produce.

Procedure. Subjects were assigned to conditions in the order of their appearance at the laboratory within the spoken-written dimension, but assignment to other groups was pseudo-random depending on availability of rooms and equipment. Some conditions were completed earlier than others, but in any given semester several conditions were usually being run. Subjects were tested individually. Subjects made an explanation, in either speech or writing, of the game of basketball. The explanation was intended for a hypothetical foreign visitor

who has never seen basketball and knows nothing about it. (The complete instructions for all conditions appear in Appendix B).

After the instructions, the speakers were recorded on audiotape and the writers were given a pad of paper on which to write.

Data preparation. The explanations generated by each subject were transcribed as closely as possible to their original spoken or written form. Speakers' hesitation sounds (e.g., "um" and "uh") and whole word repetitions were preserved, but partial-word and phoneme repetitions were eliminated. Writers' spelling was corrected to standard, unless the incorrectly spelled word was actually a true English word used incorrectly (e.g., "to" instead of "too"). Each transcript was checked by a second transcriber.

Once the data were transcribed, the frequency of occurrence of the variables of interest was determined in the following ways. Passives and prepositions were identified by using a grammar checking program. Contractions, first person pronouns, filler words ("like," "ok"), inexplicit third person reference, hesitations ("um" and "uh"), and total words were found using a word frequency program. Output from both programs was checked for false alarms. The number of unique words per block of 250 words (one from the middle of each subject's sample, to be used for calculating type-token ratio) was also found using the word frequency program. Informal hedges ("kind of" and "sort of") were found using the search function in a word processor, as was the phrase "you know," a filler word. The following variables were each scored by hand, by one scorer: coordination, sequences of prepositions, conjoining, relative clauses, nominalizations, and attributive adjectives. A second scorer scored a subset of the data in each condition.

The frequency of occurrence of each syntactic variable for each subject was divided by the total number of words that subject produced. The resulting proportions were subjected to multivariate and univariate analysis of variance. For purposes of explication the proportional frequencies were multiplied by 100 to give the mean occurrence per 100 words uttered (with the exception, of course, of type-token ratio and total words) and are shown in this form in the tables to follow.

A team of two raters scored the content of the data, using the aforementioned content scoring system to mark which particular ideas were mentioned by subjects and whether or not subjects were correct about those ideas. Discrepancies in scoring were settled by discussion. Scores on these variables were also subjected to multivariate and univariate analysis of variance.

STUDY 1: Time and Planning

The first study had two purposes: to replicate under controlled conditions the findings of previous linguistic analyses and to assess the effect of prior planning on speech and writing.

In order to understand the observed effects, one must first be able to place the study in the right places on the various continua that define conditions under which one speaks or writes (Tables 1 and 2). In this study, the factors of editability, product permanence, and physical effort were assigned the same way that they typically are in speaking or writing, as speech and writing tend to carry with them certain conditions under normal circumstances. For example, writers in the study could review and edit without leaving an overt trace, whereas speakers could not, just as in natural conditions.

Audience location was of necessity artificial for speakers, in that there was no real audience present as they spoke, so that speakers' behavior would not be influenced by the reactions of an experimenter or a second subject. In the instructions, speakers were told that they would "tell" the audience about basketball before walking into the stadium, implying that they were to imagine the audience present (as the audience would be in real life). Writers, on the other hand, were told to assume that their written copy would be shown to the recipient of the explanation, as might be a typical fate of such writing in real life.

The planning manipulation indirectly manipulated both speed (with the addition of the planning period decreasing the effects of the necessity of speeded language processing) and mental effort (with the addition of planning possibly making the spoken production task less demanding). Overall the planning

manipulation was expected to have its greatest impact on speakers.

The situation variables were, of course, controlled to be the same for all groups. Audience composition for all speakers and writers was the same hypothetical English-speaking foreign visitor. Discourse purpose was to make an explanation, which in this case fell somewhere between social and professional purposes. The topic was the game of basketball.

Predictions. The pattern of results for speakers and writers, regardless of time to produce, number of words produced or planning period should replicate the findings in the literature. For example, speakers should produce more coordination and informal hedges. Writers should produce more nominalizations and conjoining.

Adding in a planning period should affect speakers and writers differentially. For example, if prior planning reduces cognitive processing constraints for speakers, one would expect to find that speakers with a planning period use fewer informal hedges, less coordination, more nominalizations and more conjoining. Writers' use of the measured syntactic constructions should not change with planning period because their immediate online cognitive processing demands are already fairly low. Less or greater use of a construction is defined as a statistically significant difference (in the correct direction) in the occurrence of these constructions in the Plan and No-plan conditions. Table 4 shows predictions of the effects of Plan on all variables.

<div align="center">Method</div>

Analysis. Study 1 is a 2 (planning) X 3 (mode/time condition) between-groups analysis. Though it can be argued that the varying production times for speakers make this a mixed design, I am not directly interested in comparing subjects under different time constraints; therefore the analysis is a 2 x 3, with writers receiving a

Table 4

Predicted effects of Plan manipulation on syntactic variables in Study 1.

Variable	Prediction
Cognitive variables	
coordination	(NP > P) or interaction
informal hedges	(NP > P) or interaction
inexplicit 3rd person reference	(NP > P) or interaction
type-token ratio	(P > NP) or interaction
relative clauses	(P > NP) or interaction
Situational variables	
contractions	no change
1st person pronouns	no change
filler words	no change
Combination variables	
nominalizations	(P > NP) or interaction
conjoining	(P > NP) or interaction
attributive adjectives	(P > NP) or interaction
prepositions	(P > NP) or interaction
sequences of prepositions	(P > NP) or interaction
hesitations	(NP > P) or interaction
passives	(P > NP) or interaction

Note. Interaction is Plan X Mode Group.

standard time to complete the task and speakers completing it in such a way as to make two different control conditions. These control conditions equate either production time or total words produced by speakers with either production time or total words produced by writers.

Procedure. The exceptions to the general procedures outlined before are as follows. Half of the subjects (the No-Plan condition) were not allowed to plan their discourse prior to beginning to speak or write. The other half of the subjects (the Plan condition) were given a 5-minute preparation period in which to plan their discourse. Writers were permitted to write notes, while speakers were not. This difference between the conditions was intended to keep the nature of the planning period within the usual production conditions of speech and writing.

The speaking and writing conditions were as follows: two groups of subjects (i.e., one with a Plan and one with No Plan) were given up to 30 minutes to write; two groups (one Plan and one No Plan) were given up to 30 minutes to speak; and two groups (one Plan and one No Plan) were given up to five minutes to speak.

Thus, in addition to equating total time to produce (30 minutes of speech versus 30 minutes of writing), the procedure was also designed to equate total number of words produced (5 minutes of speech versus 30 minutes of writing, which should produce samples of about equal length in speech and writing because speech is produced about six times as fast as writing). The total number of words produced by subjects was an important control. One would not want to equate total words by simply truncating all the samples at a certain length because it is possible that asking subjects to speak for one half hour and asking subjects to write for one half hour engender different biases regarding the depth of discussion required. One

cannot know ahead of time if such a difference in informational demands might lead to differences in syntactic structure, though others (e.g., Drieman, 1962a) have suggested that it may be an important consideration.

Because people speak about six times as fast as they write, speaking for five minutes should invoke a demand characteristic for depth of discussion that is similar to the demand characteristic inherent in writing for thirty minutes, and should also produce texts that are close in length to those produced in thirty minutes of writing. Subjects. There were 16 male subjects in each condition. All had to meet the requirements of class status and minimum knowledge noted before.

Results and Discussion

In order to give the reader a more intuitive feel for what kind of language production is represented by the quantitative oral-written differences to be discussed in the pages that follow, I have included in Appendix C some samples of speech and writing produced by subjects in the experiments. For the sake of comparison, I have included one speaker from each of the No-Plan conditions of Study 1 and one No-Plan writer.

Inter-rater correlations for the hand-scored variables across all conditions in all experiments are shown in Table 5. As all correlations were at least 0.85, all variables scored by hand were considered to be consistent enough to be included.

In the description of the major results of Study 1 and the two experiments to follow, the results for the syntactic variables are reported in small subsections, following a report of multivariate omnibus tests and of the total words produced in each condition. The division into subsections is made according to the categories of hypothesized causes for the variables' distribution in speech and writing, namely cognitive, situational, or combination. After the three categories of causes, the

Table 5

Inter-rater correlations on hand-scored syntactic variables.

Variable	r	$p <$
attributive adjectives	.93	.0001
conjoining	.92	.0001
coordination	.83	.0001
nominalizations	.82	.0001
relative clauses	.89	.0001
sequences of prepositions	.92	.0001

Note. N = 2 scorers, 3 samples per condition.

content variables are reported. As there are no specific predictions in the literature regarding the likely effects of cognitive and situational manipulations on the content of discourse, these variables are neutral with respect to the three categories. However, it is likely that they, like so many of the syntactic variables, would be influenced by both cognitive and situational factors.

For the first study only, a description of the findings of the mode effect will precede this subdivided report of the findings for the manipulation explored in the study, that of planning period.

For all statistical tests reported, alpha is set at 0.05.

The average total number of words produced in each condition was as follows: No Plan 5-minute speakers and Plan 5-minute speakers produced 721.37 ($\underline{s}$ = 149.79) and 789.50 ($\underline{s}$ = 151.08) words, respectively. No Plan 30-minute speakers and Plan 30 minute speakers produced 2337.50 ($\underline{s}$ = 1255.75) and 3065.31 ($\underline{s}$ = 1167.24) words, respectively. No Plan and Plan writers produced 571.31 ($\underline{s}$ = 127.75) and 566.00 ($\underline{s}$ = 118.15) words, respectively. There was a main effect of Mode Condition ($\underline{F}$ (2, 90) = 88.84, MSE = 44641622.16, $\underline{p}$ < .0001), plus a marginal main effect of Plan ($\underline{F}$ (1, 90) = 3.32, MSE = 1666901.04, $\underline{p}$ < .08) and a marginal interaction of Mode Condition by Plan ($\underline{F}$ (2, 90) = 2.60, MSE = 1304070.57, $\underline{p}$ < .09) on these data.

Post-hoc Tukey tests revealed no significant differences among any of the written or 5-minute spoken groups. This was the intended outcome, as the purpose of the 5-minute spoken group was to be able to equate total words produced in speech and writing. The two 30-minute spoken groups produced significantly more words than either writers or 5-minute speakers, as expected, but did not differ from

one another.

Mode differences.

Syntactic variables. In tables 6, 7 and 8 are shown the mean frequencies for the variables in the speaking and writing conditions of Study 1, organized by Plan and Mode Condition, for the Cognitive, Situational and Combination cause groups, respectively. The proportional frequencies have been multiplied by 100 for the syntactic measures, yielding an average frequency of occurrence of each construction per 100 words uttered.

In order to control alpha, MANOVAs were conducted before examining any univariate tests. Variables in each cause group (i.e. category) are conceptually related by the predicted results for each group, and the results for each group were predicted to vary from each other group in particular ways under a given manipulation. Therefore, combining all variables within a study into one MANOVA does not make conceptual sense. Such an analysis would also introduce unnecessary statistical noise, as variables with different causes and underlying distributions reacted to a manipulation by changing in different directions or not at all. Because of these considerations, a MANOVA was performed for each cause group of variables to see if there was an overall difference, within each cause group, by the factors manipulated in each study.

The MANOVAs for Mode Group, performed within each cause group, yielded significant Mode effects for all groups of variables: Cognitive (Hotelling-Lawley Trace $F(10, 170) = 10.74$, $p < .0001$); Situation (Hotelling-Lawley Trace $F(8, 172) = 24.09$, $p < .0001$); Combination (Hotelling-Lawley Trace $F(4, 87) = 2.61$, $p < .05$).

As a further check on statistical robustness, the significance of the overall

Table 6

Average frequencies of Cognitive variables per 100 words, by Plan and Mode Condition, Study 1.

| | Plan condition | | | |
| | No Plan | | Plan | |
Variable	Mean	S.D.	Mean	S.D.
coordination				
30 minute spoken	2.70	(0.54)	2.36	(0.91)
5 minute spoken	1.54	(1.02)	2.76	(1.23)
written	0.71	(0.46)	0.64	(0.45)
inexplicit 3rd person ref.				
30 minute spoken	1.25	(0.44)	1.78	(0.56)
5 minute spoken	1.91	(0.93)	0.86	(0.41)
written	0.77	(0.56)	0.82	(0.55)
informal hedges				
30 minute spoken	0.10	(0.13)	0.04	(0.07)
5 minute spoken	0.12	(0.23)	0.05	(0.17)
written	0.00	(0.00)	0.00	(0.00)
relative clauses				
30 minute spoken	0.78	(0.35)	0.81	(0.26)
5 minute spoken	0.72	(0.47)	0.86	(0.43)
written	0.91	(0.55)	1.03	(0.37)
type-token ratio				
30 minute spoken	0.46	(0.03)	0.45	(0.05)
5 minute spoken	0.46	(0.04)	0.46	(0.05)
written	0.47	(0.04)	0.49	(0.03)

Note. N = 16 per condition.

Table 7

Average frequencies of Situational variables per 100 words, by Plan and Mode Condition, Study 1.

| | Plan condition | | | |
| | No Plan | | Plan | |
Variable	Mean	S.D.	Mean	S.D.
contractions				
30 minute spoken	3.51	(1.06)	3.08	(1.53)
5 minute spoken	3.26	(1.29)	2.74	(1.07)
written	0.23	(0.29)	0.13	(0.27)
filler words				
30 minute spoken	0.50	(0.50)	0.69	(0.66)
5 minute spoken	0.37	(0.49)	0.48	(0.57)
written	0.00	(0.00)	0.00	(0.00)
1st person pronouns				
30 minute spoken	1.07	(1.02)	0.59	(0.50)
5 minute spoken	0.61	(0.58)	0.61	(0.41)
written	0.08	(0.15)	0.04	(0.11)

Note. $N = 16$ per condition.

Table 8

Average frequencies of Combination variables per 100 words, by Plan and Mode Condition, Study
1.

| | Plan condition | | | |
| | No Plan | | Plan | |
Variable	Mean	S.D.	Mean	S.D.
attributive adjectives				
30 minute spoken	5.37	(1.05)	6.44	(1.12)
5 minute spoken	5.98	(1.17)	6.62	(1.12)
written	8.56	(1.76)	7.47	(1.47)
conjoining				
30 minute spoken	0.74	(0.16)	1.24	(0.83)
5 minute spoken	1.06	(0.60)	1.33	(0.55)
written	1.40	(0.49)	1.72	(0.63)
hesitations				
30 minute spoken	4.44	(2.11)	2.03	(1.36)
5 minute spoken	6.00	(2.95)	3.15	(2.34)
written	0.00	(0.00)	0.00	(0.00)
nominalizations				
30 minute spoken	1.15	(0.69)	1.10	(0.47)
5 minute spoken	0.86	(0.70)	1.74	(0.80)
written	2.06	(1.29)	2.24	(1.02)
passives				
30 minute spoken	0.63	(0.26)	0.82	(0.37)
5 minute spoken	0.68	(0.29)	0.82	(0.44)
written	1.38	(0.69)	1.43	(0.42)
prepositions				
30 minute spoken	10.67	(1.44)	10.86	(1.01)
5 minute spoken	10.42	(1.50)	10.46	(0.91)
written	11.28	(1.81)	12.27	(2.06)
sequences of prepositions				
30 minute spoken	0.96	(0.36)	0.91	0.33)
5 minute spoken	0.51	(0.38)	1.07	0.45)
written	1.52	(0.74)	1.40	0.77)

Note. N = 16 per condition.

univariate model associated with each variable was examined before any main effects or interactions were evaluated. With the exception of two variables (relative clauses and type-token ratio), there was a significant overall difference among conditions for each of the variables measured in Study 1.

Although informal hedges showed only a marginal univariate F in this test (at $p < .07$), it will be retained in the next two studies because there does appear to be a real Mode difference: whereas no writers used informal hedges, between 25% and 50% of subjects in each spoken condition used informal hedges at least once.

The results of the univariate ANOVAs for individual variables across all conditions are shown in Table 9.

Tukey tests (at alpha = .05) collapsed across Plan on those variables with a significant overall difference between conditions revealed a pattern of results for Mode in the syntactic constructions measured that replicates the pattern reported in the literature, irrespective of time to produce (in the two different kinds of speaking conditions). Specifically, speakers in both time conditions produced, as expected, more filler words, hesitations, first person pronouns, inexplicit third person references, contractions, and coordinating constructions than did writers. Informal hedges, as mentioned, performed marginally in the overall univariate model test.

Writers, as expected, produced more prepositions, sequences of prepositions, passive constructions, conjoining, attributive adjectives, and nominalizations than did speakers.

There were two variables that did not show the expected pattern of Mode differences, because they did not show any overall differences among conditions and therefore no other effects were examined. There was no overall difference

Table 9

Uunivariate ANOVAs for each variable, showing overall differences across all six conditions of

Study 1.

Variable	F (5, 95)	MSE	$p <$
coordination	21.69	0.68	.0001
inexplicit 3rd person reference	11.51	0.36	.0001
informal hedges	2.11	0.02	.08
relative clauses	1.07	0.19	.39 NS
type-token ratio	1.67	0.0016	.16 NS
contractions	35.75	1.08	.0001
1st person pronouns	7.82	0.31	.0001
filler words	6.20	0.21	.0001
attributive adjectives	11.94	1.71	.0001
conjoining	5.22	0.34	.001
hesitations	27.25	3.42	.0001
nominalizations	6.83	0.76	.0001
passives	10.56	0.19	.0001
prepositions	3.41	2.28	.01
sequences of prepositions	7.43	0.29	.0001

Note. First group is the cognitive variables, second is situational, third is combination.

among conditions for relative clauses ($\underline{F}$ (5, 90) = 1.07, MSE = 0.1723, $\underline{p}$ < .33) and type-token ratio ($\underline{F}$ (5, 90) = 1.67, MSE = 0.0017, $\underline{p}$ < .12).   The failure to replicate the results in the literature for type-token ratio and relative clauses is unexpected, but the explanation may be simple. For relative clauses, the reason for this negative finding may be that this is simply not a variable that really varies systematically with mode or any other condition. Chafe (1982) included the variable as one with an apparent mode difference, but in his later paper with Danielowicz (Chafe & Danielowicz, 1987) the variable is no longer discussed or even mentioned, suggesting that it may have failed to replicate for the authors of that paper as well.

Type-token ratio, unlike relative clauses, has been consistently reported to be higher in writing than in speech, making the finding in this study unusual. However, there may be an explanation. Type-token ratio is sensitive to variability in the total number of words in the sample used to calculate the ratio. All of the studies except one (Portnoy, 1973) that report differences in type-token ratio used sample sizes that varied at least slightly.

Portnoy (1973) performed her type-token ratio analysis on the entire sample from each subject. Her mode effect was robust, at $\underline{p}$ < .01, and her type-token ratios (at .53 for speakers and .58 for writers) were higher both for speakers and for writers than the means for the present investigation (means in this study range between .45 and .49). As Portnoy's samples all consisted of the first 219 words from each subject, it could be that her type-token ratio differences come from subjects in the spoken group "warming up" and getting used to the speech situation, therefore producing more redundancy in the beginning than they might have toward

the middle of their discourse. Writers have a less obvious need to warm up or get going, so there is no reason to expect speakers' redundancy to vary much between the beginning and later portions of the discourse. Portnoy does not mention how long the original samples were before she truncated them at 219 words (presumably the length of the shortest sample), but with 20 minutes to produce the discourse, one can guess that the spoken samples were about 2000 words long, an ample length to avoid a warm-up effect if one wanted to take samples from the middle. Why her type-token ratios are larger overall than the ones obtained in the current study is unclear.

The type-token ratios reported here are calculated on identical sample sizes of 250 words each, one sample from the middle of the explanation produced by each subject. Leveling out the denominator in the calculation and taking the samples from the middle of the discourse could have caused the traditionally observed difference to disappear.

Because type-token ratio and relative clauses did not differ reliably between speech and writing in this first study, they will not be used for comparison in evaluating any of the manipulations in the next two experiments.

Content variables. One scorer coded all subjects' data for content. A second scorer independently coded 111 subjects' data and also met with the first scorer occasionally to discuss scoring. The first scorer sometimes changed the recorded scores based on these discussions, and it is these discussed scores that are reported when coding was changed. Inter-rater correlations of the content coding by the two scorers are shown in Table 10.

The inter-rater correlations were quite high on all variables except percent incorrect. Percent incorrect was to be used as a reflection of subjects' knowledge

Table 10

Inter-rater correlations on content measures.

Variable	r	p level
total ideas communicated	.92	.0001
rules communicated	.92	.0001
strategies communicated	.90	.0001
Duke ideas communicated	.82	.0001
total incorrect ideas	.50	.0001

Note. N = 2 scorers.

of basketball; however, because of the measure's poor reliability, it was not used for comparisons, although high error scores for a subject were used as a basis for disqualification. Only three subjects were removed because of high error scores.

Table 11 shows the results by Mode Condition for the content measures.

A MANOVA was conducted to control alpha on the content variables: rules per 100 words, strategies per 100 words, and Duke-related ideas per 100 words. Overall, there was a significant univariate main effect of Mode Group (Hotelling-Lawley Trace F (6, 174) = 46.70, p < .0001).

Total ideas expressed per 100 words and total ideas expressed per unit time were not included in the MANOVA because they are both composites of the other three measures and therefore exhibit multicollinearity with those measures. Of course, these two measures are highly related to each other. However, total ideas expressed per 100 words and per unit time can give information about content which cannot be shown with any of the other measures, so they have been included in the discussion of content. In order to control alpha in this case, an effect on total ideas expressed per 100 words or total ideas expressed per unit time is considered statistically significant at an alpha level of .017, using the Bonferroni adjustment[2].

Writers were more efficient in ideas expressed per word uttered (cf. Horowitz & Newman, 1964; Horowitz & Berkowitz, 1964), producing more ideas per 100 words than did speakers (F(2, 90) = 132.99, MSE = 45.41, p < .0001). Post-hoc Tukey tests showed the differences among all Mode Groups to be reliable, such that speakers in the 5-minute groups produced reliably fewer ideas per 100 words than did writers, and speakers in the 30-minute conditions produced reliably fewer ideas per 100 words than 5-minute speakers. This effect is interesting, as

Table 11

Means and standard deviations of content measures by Plan and Mode Condition, Study 1.

	Plan condition			
	No Plan		Plan	
Variable	Mean	S.D.	Mean	S.D.
total ideas/100 words				
30 minute spoken	1.59	(0.49)	1.40	(0.45)
5 minute spoken	2.34	(0.54)	2.21	(0.50)
written	3.61	(0.77)	4.05	(0.68)
rules / 100 words				
30 minute spoken	1.16	(0.36)	1.05	(0.39)
5 minute spoken	1.92	(0.50)	1.89	(0.55)
written	2.92	(0.50)	3.42	(0.69)
strategies / 100 words				
30 minute spoken	0.33	(0.13)	0.26	(0.06)
5 minute spoken	0.30	(0.16)	0.26	(0.13)
written	0.52	(0.46)	0.54	(0.42)
Duke ideas / 100 words				
30 minute spoken	0.10	(0.12)	0.08	(0.05)
5 minute spoken	0.11	(0.13)	0.05	(0.07)
written	0.17	(0.29)	0.09	(0.17)

Note. N = 16 per group

speakers in the 5-minute group did not differ reliably from writers on total words produced, but nonetheless, 5-minute speakers produced fewer ideas than writers per 100 words uttered. Controlling output volume was clearly not the same thing as controlling output content. Speakers were less efficient than writers at communicating discrete ideas.

The same pattern holds for rules uttered per 100 words, with a main effect of Mode ($F(2, 90) = 132.26$, MSE $= 34.61, p < .0001$), and significant Tukey tests among all three Mode Groups. Again, 30-minute speakers were the least efficient at producing rules per 100 words uttered, and writers were the most efficient.

Strategies uttered per 100 words shows a similar, but not identical, pattern to those for rules and total idea units per 100 words. For strategies, there is a main effect of Mode, again with Writers conveying the most strategy-related ideas per 100 words uttered ($F(2, 90) = 7.98$, MSE $= 0.61, p < .001$), but Tukey tests show only a difference between speakers and writers, not between groups of speakers. Thus it appears that when speakers produced more words about basketball, those extra words were likely either additional rules, elaborations on a point being expressed, hesitations, or some other linguistic phenomenon. It was not a matter of emphasizing a different category of ideas, such as strategies rather than rules.

Speakers and writers did not differ in the production of Duke-related ideas ($F < 1$).

What can account for the difference in communicative efficiency for total ideas communicated per 100 words? According to the data on Type-token ratio, speakers are not repeating particular words more often than are writers, on average.

The data for total ideas produced per 100 words do, however, mimic the pattern of findings for hesitations. 30-minute speakers produced more hesitations than 5-minute speakers, who produced more hesitations than writers. The greater the proportion of one's words that are taken up with non-meaningful utterances, the fewer meaningful ideas one may be able to produce in a given number of words. But this is probably not the whole explanation, as the average number of hesitations in the 30-minute Spoken conditions was 4.58, hardly enough "words" to construct even one extra idea unit of the length seen in this study.

Part of the Mode difference in ideas per 100 words may result from the categorization system itself. The raters were to try to match, as closely as possible, the ideas in the subjects' data to the ideas on the scoring sheets. Though the scoring system could not show this, some subjects elaborated far more on an idea than others did, giving more details. But regardless of the detail of the statement, if the "gist" was considered to match a particular item on the scoring sheet, then the idea was classified as that item. Speakers may do this more often than writers because of the low relative cost in terms of effort of uttering extra words, whereas writers may decide to omit details that come to mind because of the cumbersome nature of writing by hand. Every extra word takes seconds to write but tenths of seconds to speak.

Any extra details[3] speakers uttered, added to the repetitions, instances of false starts, hesitations, and other phenomena of speech that are absent in writing, probably combined to show speakers as highly inefficient conveyors of information. What the data suggest, instead, is that speakers may have provided more detailed information, beyond the "bare bones" statement of a point.

There may also be stylistic rules regarding the inclusion of details,

examples, or extraneous information in an explanation in speech or writing. Such stylistic rules might encourage speakers to give more details and examples or discourage writers from doing so. This hypothesis cannot be evaluated from the data in Study 1, but will be examined in Study 3.

The idea of efficiency of production can be looked at another way as well, in terms of production per unit time, so a separate analysis of efficiency, this time in ideas per unit time rather than using words as the unit, was also carried out. In this analysis, the raw scores for total ideas communicated were expressed as a function of five minute units. Because ideas expressed per five minutes is strongly related (both theoretically and empirically) to the per-100-words measures already discussed, they were not included in the above MANOVA, but the previously mentioned adjustment to alpha applies.

Collapsed across Plan condition, 5-minute Speakers produced the largest number of ideas in five minutes, with a mean of 16.65 (S.D. = 3.16). 30-minute Speakers produced the next largest number of ideas per five minutes, with a mean of 5.91 (S.D. = 1.57). Writers produced the smallest number of ideas per 5 minutes of production, with an average of 3.62 ideas communicated per 5 minutes (S.D. = 0.96). There was an overall main effect of Mode Group on ideas produced per five minutes ($\underline{F}(2, 90) = 347.14$ MSE = 1550.61, $\underline{p} < .0001$) and Tukey tests showed significant differences among all three groups. Thus it is clear that the higher speed of speech leads to some increased speaker efficiency in expression of ideas per unit time compared to writers. However, from the magnitude of the differences between spoken groups, one can see that there is a diminishing returns effect of increased time to produce. As time to produce increased, speakers became less efficient in producing additional ideas, such that

30-minute speakers produced far fewer ideas per 5-minutes of production time than did 5-minute speakers.

So far the effects of Mode Group on expressed content confirm what many, who measured only syntactic variables, have inferred through syntax data alone about the content of speech and writing. Writers appear to communicate more ideas in fewer words, possibly through the omission of details, and possibly also through differences in syntactic structure. In addition, it has been shown that speakers produce not only more words, but more ideas per unit time, than writers (cf. Horowitz & Newman, 1964; Horowitz & Berkowitz, 1964).

Effects of Plan

The mode effects in the literature on syntax and content now established, an examination of the effects of cognitive and stylistic manipulations can be undertaken, in an effort to find explanations for these differences. I begin with the Plan manipulation, which should affect cognitive processing load.

Please refer to the data in Tables 6 - 8 for the following discussion.

Before discussing the overall pattern of results for the three groups of syntactic variables, let us first examine the results for the manipulation check variable, hesitations. As previously noted, frequency of hesitations is known to reflect, at least in part, the cognitive processing load of speakers. A decrease in hesitations during utterances in the Plan condition, as shown by a main effect of Plan and/or interaction of Plan by Mode Group therefore would support the idea that speakers are working under a lower processing load in the Plan condition than in the No Plan condition.

As expected if the Plan manipulation was successful, the variable hesitations shows both a main effect of Plan (F (2, 90) = 21.60, MSE = 73.92, $p < .0001$)

and an interaction of Mode Condition by Plan (F (2, 90) = 5.51, MSE = 18.85, p < .01). Tukey tests reveal that there are fewer hesitations with a Plan than without for each spoken Mode Group (i.e., 30-minute spoken and 5-minute spoken), and no difference by Plan for Writers (who, of course, produce no hesitations).

The pattern of data for hesitations is what one would expect to see if indeed adding a planning period prior to the production period reduced the cognitive load in speech. Basic research in speech production has long confirmed that planning takes place during filled and unfilled pauses in speech (e.g., Goldman-Eisler 1961; 1968). The decrease in these filled pauses by speakers who had the opportunity to plan their utterances before beginning suggests that some of the cognitive processing load of speech was indeed reduced by allowing some planning to take place ahead of time. Thus the pattern of this variable serves as a check on the manipulation, assuring that the planning manipulation did affect cognitive processing load.

Now that the Plan manipulation has been shown to affect cognitive processing constraints, let us turn to the other effects of that manipulation. Generally, because only one cognitive variable showed an interpretable effect of Plan, there was not much support in Study 1 for the notion that this group of variables is affected solely by cognitive processing constraints. The situational variables all performed as expected, however, showing no effect of the cognitive manipulation of planning. The combination variables supported the argument that there is a cognitive processing contribution to syntactic differences between speech and writing on five out of the six combination variables, showing either expected main effects of Plan or interactions of Plan and Mode Group.

Cognitive variables. Support for the notion that a variable is affected by cognitive constraints would be found if a variable were affected by the addition of a

prior planning period, i.e., if there were a main effect of Plan or an interaction of Plan and Mode Group. Specifically, for the cognitive variables, one would expect fewer informal hedges, inexplicit third person references, and coordinating constructions in the Plan groups, at least for the Speakers.

There was only a marginal MANOVA main effect of Plan for the cognitive variables (Hotelling-Lawley Trace $\underline{F}(5, 86) = 2.08$, $\underline{p} < .08$), so no main effects of Plan on individual cognitive variables will be examined. There was a MANOVA interaction of Mode Group X Plan, however (Hotelling-Lawley Trace $\underline{F}(10, 170) = 5.90$, $\underline{p} < .0001$).

Of the three cognitive variables, two showed a significant Mode Group X Plan interaction, but only one, inexplicit third person reference, seems to be affected in an interpretable way by the cognitive manipulation, planning. Interactions of Mode Group and Plan were obtained for both inexplicit third person references ($\underline{F}(2, 90) = 14.62$, MSE $= 5.24$, $\underline{p} < .0001$) and coordination ($\underline{F}(2, 90) = 8.06$, MSE $= 5.50$, $\underline{p} < .001$). There was no interaction for informal hedges ($\underline{F} < 1$). Only the interaction for inexplicit third person references showed an effect on speakers in the predicted direction by Tukey test, whereas the one for coordination is difficult to interpret. For a more detailed look at post-hoc analyses of interactions for individual variables in all studies, please see Appendix D, Post-hoc Analysis of Interactions.

It is clear from the previously examined effect of planning on hesitations that cognitive load was in fact affected by the manipulation of planning, so it is not an overall manipulation failure that is at fault in the failure of this group of variables to show an interpretable Plan effect. Thus, from this manipulation alone, it is difficult to believe that the category of pure cognitive constraint variables is very useful.

The outcome of Experiments 2 and 3 will provide more information about influences on this group of variables.

Situational variables. The situational variables all performed as expected. Although there was an overall significant MANOVA main effect of Plan for these variables (Hotelling-Lawley Trace $F(4, 87) = 2.61$, $p < .05$), there was no main effect of Plan on any of the situational variables: contractions ($F (1, 95) = 2.55$, MSE $= 2.71$, $p < .12$); first person pronouns ($F (1, 95) = 2.44$, MSE $= 0.86$, $p < .13$); passives ($F (1, 95) = 2.72$, MSE $= 0.49$, $p < .11$); and filler words ($F < 1$). There was likewise no interaction of Plan by Mode Condition for any of the situational variables (Hotelling-Lawley Trace $F < 1$). There is little else to say about this expected null result.

Combination variables. These variables, like the cognitive variables, would also be expected to show some effect of the addition of a planning period, in the form of an overall main effect of Plan and/or as an interaction of Plan by Mode Group. That was the general pattern found for four of the seven combination variables, with a some minor deviations.

Overall, the MANOVA tests on the combination variables showed a significant main effect of Plan (Hotelling-Lawley Trace $F (6, 85) = 5.28$, $p < .0001$) and a significant Plan X Mode Group interaction (Hotelling-Lawley Trace $F (12, 168) = 3.91$, $p < .0001$).

One exception to the general pattern of results of the effects of Planning on combination variables was passive constructions, which showed no main effect of Plan ($F(1, 90) = 1.22$, MSE $= 0.37$. $p < .16$) and no interaction ($F < 1$).

Another exception to the general pattern of results was prepositions, which showed no effect of Plan either as a main effect ($F (1, 90) = 1.77$, MSE $= 4.03$, p

< .19), or as an interaction with Mode Condition ($F < 1$). However, a related variable, sequences of prepositions, did show the expected pattern. Interactions of Mode Condition by Plan were obtained for sequences of prepositions ($F (2, 90) = 3.99$, $MSE = 1.15$, $p < .05$), though no main effect of Plan ($F (1, 90) = 1.43$, $MSE = 0.41$, $p < .24$) was found.

Nominalizations, while not really an exception to the pattern, produced only a marginal main effect of Plan ($F(2, 90) = 3.62$, $MSE = 2.54$. $p < .07$) and a marginal interaction of Plan with Mode Group ($F(2, 90) = 2.48$, $MSE = 1.87$. $p < .09$). Inspection of the means showed that these marginal effects may tend to support a role of Planning in the use of nominalizations.

Like sequences of prepositions, attributive adjectives showed an interaction of Plan by Mode Group ($F (2, 90) = 6.09$, $MSE = 10.43$, $p < .01$) and no main effect of Plan ($F < 1$).

Hesitations, as mentioned previously (in the manipulation check section), showed both a main effect of Plan and an interaction of Plan X Mode Group.

Conjoining showed an expected main effect of Plan (in addition to the main effect of Mode already discussed), with subjects in the Plan condition using more conjoining than subjects in the No Plan condition ($F (2, 95) = 9.47$, $MSE = 3.27$, $p < .01$). There was no interaction ($F < 1$).

The interactions for combination variables generally support the notion that it is the speakers who are most affected by the planning period. In both cases of interaction, the interactions of Plan by Mode Group are driven by changes in the spoken conditions, particularly in the 5-minute spoken groups. Please see Appendix D for an extended discussion of post-hoc tests on the interactions.

Overall, most of the effects of Plan on the combination variables were

concentrated on the speakers, as one can see in the patterns of the interactions and even the main effects of Plan. Writers would not be expected to be affected as much by prior planning as Speakers might be, as writers are free from the other constraints of keeping up a continuous stream of language and producing language quickly. Thus writers may plan as they go and still have the time to choose more carefully their words and syntax, even in a first pass. One can argue that the addition of a period for prior planning adds to the available cognitive resources of speakers, allowing them to use more easily some of the positive features of writing and to reduce some of the dysfluencies of speech. The issue of a literacy-centered view of 'good language' that is suggested by this conclusion will be taken up in the General Discussion.

One other observation is worth noting here regarding the magnitude of differences between speech and writing in the first study. In the original design of this study, subjects in the 30-minute Spoken with Plan and the Written with Plan conditions were given an opportunity to change their original explanations by editing after the first pass, in order further to increase, within naturalistic boundaries, the differences between the two modes by taking advantage of writers' ability to edit after the fact.

In this early procedure, writers were given back their papers along with a red pen, and speakers were given more blank tape. Both groups were instructed to make any changes they thought would improve their explanations, with no specific details about what "improve" meant. Writers were to write their corrections on their explanations, whereas speakers were to recall passages they were dissatisfied with and correct by saying "where I said X, I should have said Y." Whereas writers usually did some editing on their papers, speakers were generally unable to

make use of the editing opportunity; they tended instead to add details they thought that they had left out, or to begin on a new topic not covered in the first pass. Some spoken subjects said that they could not remember their explanations well enough to know what they should change. The procedure was abandoned when it was found that speakers could make no use whatsoever of the editing function and the pre-editing syntactic differences appeared large anyway. The point that can be drawn from this is that our estimate of spoken - written differences in Study 1, although large, is possibly even an underestimate compared to what it might be if the usual editing processes in writing (vs. the absence of such processes in speech) were also included.

Content variables. Please refer to Table 11 for the means of the content measures.

The MANOVA on the effects of Plan on content measures yielded no main effect of Plan (Hotelling-Lawley Trace $\underline{F}$ (3, 88) = 1.40,$\underline{p}$ < .25), and no interaction of Mode Group X Plan (Hotelling-Lawley Trace $\underline{F}$ (6, 174) = 1.30,$\underline{p}$ < .26).

There was also no significant effect of Plan on ideas per 100 words ($\underline{F}$ < 1), although there was a marginal interaction of Plan and Mode Group ($\underline{F}$(2, 90) = 2.86, MSE = 0.98, $\underline{p}$ < .07). Likewise there was no main effect of Plan on ideas per five minutes ($\underline{F}$(1, 90) = 2.51, MSE = 11.23, $\underline{p}$ < .12) and no interaction ($\underline{F}$ < 1). Thus the cognitive manipulation of planning appears not to have a large effect on content expressed.

Summary

The results from Study 1 confirmed under controlled conditions the basic findings of the literature concerning the distribution of this large set of variables in

speech and writing. The only exceptions to this are the variables relative clauses and type-token ratio.

The cognitive manipulation of Planning did not have the expected effect on the distribution of variables in the Cognitive group, casting some doubt in this early stage on the validity of that group.

As expected, cognitive manipulations did not affect the situational variables.

Prepositions and passives were not affected, even marginally, in the expected way by the Plan manipulation. But generally, so far the cognitive part of the combination of influences on the combination variables is supported by the data.

In one more predicted finding, the Plan manipulation had a greater effect on speakers than on writers, supporting the notion that speakers have the most to gain from a preparation period.

Overall, writers were more efficient at communicating ideas than were speakers, producing more total ideas, rules, and strategies per 100 words uttered. Some possible reasons for this difference in efficiency include the hesitation phenomena documented in the syntactic part of the study, the use by speakers of more details surrounding a particular idea, and the relatively lower cost in effort to speakers for producing more words. In study 3 the focus will turn to the effects of a stylistic manipulation on this efficiency effect. Study 3 will assess if the difference in efficiency results, at least in part, from stylistic rules about level of detail and verbosity appropriate in each mode.

The planning period produced few effects on content in this study, although there was one marginal interaction of Plan and Mode on ideas per 100 words.

STUDY 2: Limiting writer's access to earlier output

In Study 1 I confirmed under controlled conditions the general findings of the literature regarding typical syntactic features of speech and writing, and I tested one aspect of cognitive processing constraints by manipulating prior planning time. It was found that the combination variables were, in general, affected as predicted by this cognitive manipulation, although the cognitive variables generally were not. It was also found that, where it was effective, the Plan manipulation had its greatest effect on speakers, functionally increasing their available cognitive resources during production.

In Study 2, it is the writers whose cognitive resources are manipulated. Their cognitive processing load is theoretically increased by removing one advantage of writing, the ability to review (and edit) previously uttered language instead of relying entirely on memory of previous utterances. In order to prevent review, writers were required to write on paper accessible only through a window in a cardboard sleeve. This manipulation was expected to increase writers' memory load, thus making their writing appear more like speech, but only on those variables that should be affected by (non-speed-related) cognitive processing constraints.

The baseline conditions for comparison in Study 2 will be the No Plan conditions, with only one spoken condition, the 5-minute condition. Although there were a few differences in Study 1 between the speakers in the 30-minute and the 5-minute conditions, as seen, for example in interactions of Mode Group with Plan, overall there is no a priori theoretical reason to prefer one condition or the other. The 5-minute condition, which approximates total words produced in speech and writing, also reduces transcription and related work by a factor of about 80

percent and was thus chosen on practical grounds.

Before examining the findings of this manipulation, one should be aware of where to locate this study on the various continua of Tables 1 and 2. In this case, organ, speed, audience location, product, physical effort and mental effort are held constant as in the No-Plan conditions of Study 1. Review- and editability is manipulated for one group of writers by denying them access to their previous utterances as they compose. Audience composition, discourse purpose, and topic are also all the same as in Study 1.

The logic used to evaluate the results of the window manipulation is as follows: For those variables expected to be affected by cognitive processing constraints, the pattern found for writers in the window manipulation should more closely resemble the pattern found in baseline speech than that in baseline writing. More concretely, cognitive variables that are usually more frequent in speech (with the exception of those that seem most directly related to speeded processing rather than to editability) should become, at a minimum, more frequent in the window condition than in ordinary writing. Cognitive variables that are usually more frequent in writing should become, at a minimum, less frequent in the window condition than in ordinary writing. More or less frequent is defined as, at a minimum, statistically different (in the correct direction) from writing. Even stronger support for a variable's being affected by this manipulation would be if that variable not only were reliably different from writing but also statistically indistinguishable from speech. Stylistic choice variables, of course, should not change.

Predictions. Relative to the frequencies of these variables in writing, coordination, for example, should increase, while nominalizations and conjoining should

decrease. Table 12 shows predictions of effects for all syntactic variables in Study 2, organized by cause group.

Method

<u>Subjects</u>. There were 16 subjects in each condition.

<u>Procedure</u>. Subjects wrote on paper in a small slot in a cardboard sleeve. The slot is wide enough for a person to write about 5 words or a phrase. Once the subject had written in the slot to the end, he had to push the paper up in the slot in order to write the next line. This prevented the subject from looking at anything written before. Thus the writer, like the Speaker, had to rely on memory for what had been produced rather than just looking back at the previously emitted text.

<u>Apparatus</u>. The cardboard sleeve was constructed of 2 layers of poster board cut to dimensions of 28 X 71 cm. on the top and 28 x 35.5 cm. on the bottom. The bottom piece was shorter to reduce friction as the paper passed through the apparatus. The two main pieces of cardboard were glued together with a strip of poster board measuring 2.5 x 35.5 cm. glued in between the larger pieces on each long edge. These strips allowed the paper to move through more easily by making the vertical distance between the two main pieces of cardboard somewhat larger. A horizontal slot measuring 1 x 10 cm. was cut into the top piece of poster board to allow space for writing on the paper that was fed through. Along the left side of the top piece of poster board, a slot measuring 3 x 11 cm. was cut, parallel to the long sides of the sleeve. This slot allowed the subject contact with the paper in order to push the paper forward with a finger as needed to continue writing. Next to the long slot was drawn an arrow pointing away from the subject, indicating the direction in which the paper should be pushed.

The paper upon which subjects wrote was continuous-feed computer paper

Table 12

Predicted effects of Window manipulation on syntactic variables in Study 2, by cause groups.

Variable	Prediction
cognitive variables	
coordination	more in window than written
inexplicit 3rd person reference	more in window than written
informal hedges	no change
situational variables	
contractions	no change
filler words	no change
1st person pronouns	no change
combination variables	
attributive adjectives	fewer in window than written
conjoining	fewer in window than written
hesitations	no change
nominalizations	no change
passives	fewer in window than written
prepositions	fewer in window than written
sequences of prepositions	fewer in window than written

with the tractor-feed holes torn off. Sufficient paper was stacked up on the floor to feed the sleeve without any subject's running out. As the paper was fed forward through the sleeve, the writing was covered by the sleeve until the paper fell out behind the table. The writing, except for the portion within the slot in which the subject was writing, was never visible.

<div align="center">Results and Discussion</div>

A MANOVA over all of the conditions and variables in the analysis of syntax was significant for all three groups of variables: Cognitive (Hotelling-Lawley Trace $\underline{F}$ (6, 84 = 7.57, $\underline{p}$ < .0001); Situation (Hotelling-Lawley Trace $\underline{F}$ (8, 82) = 17.97,$\underline{p}$ < .0001); and Combination (Hotelling-Lawley Trace $\underline{F}$ (12, 78) = 13.59, $\underline{p}$ < .0001). These results allow for the examination of individual variables for overall differences among conditions and permit the use of planned contrasts.

Window writers produced, on average, a total of 483.62 ($\underline{s}$ = 126.22) words. Planned contrasts show that this is only marginally less than the total words produced by No Plan writers from Study 1 ($\underline{M}$ = 571.31; $\underline{F}$ (1, 45) = 3.37, MSE = 61512.78, $\underline{p}$ < .08) and statistically less than the total words produced by 5-Minute No Plan speakers from Study 1 ($\underline{M}$ = 721.37; $\underline{F}$ (1, 45) = 24.81, MSE = 452200.50, $\underline{p}$ < .0001). Thus there was, predictably, no significant effect of the window manipulation on total words produced by writers using the apparatus.

Cognitive variables. The mean frequencies of occurrence of the cognitive variables are shown in Table 13.

None of the cognitive variables showed a significant difference from baseline Writing under this manipulation (all $\underline{F}$s < 1). Informal hedges was not expected to show an effect, but neither coordination nor inexplicit third person

Table 13

Average frequencies of Cognitive variables per 100 words, Study 2.

Variable	Mean	S.D.
coordination		
5 minute spoken	1.54	(1.02)
window	0.79	(0.53)
written	0.71	(0.46)
inexplicit 3rd person ref.		
5 minute spoken	1.91	(0.93)
window	0.95	(0.61)
written	0.77	(0.56)
informal hedges		
5 minute spoken	0.12	(0.23)
window	0.00	(0.00)
written	0.00	(0.00)

Note. N = 16 per condition.

reference showed one either. Thus editability does not appear an important factor in the distribution of these variables in speech and writing. Coordination, in fact, has not been affected by either cognitive manipulation used so far.

Situational variables. The mean frequencies of Situational variables per 100 words are shown in Table 14.

As one would expect, none of the situational variables (contractions, first person pronouns, or filler words) differed reliably from baseline Writing under this manipulation (all $\underline{F}$s < 1). Little more can be said about this expected null result.

. Combination variables. The mean frequencies of the Combination variables per 100 words are shown in Table 15.

Conjoining was the only variable in the combination category to show a statistically significant effect of the window manipulation. Planned contrasts between the Window and Written conditions on conjoining revealed that, as would be expected, there was significantly less conjoining in the Window than in the baseline Written condition ($\underline{F}$ (1, 45) = 7.99, MSE = 2.12, $\underline{p}$ < .01). There was no difference between the Window and the baseline Spoken conditions ($\underline{F}$ < 1).

One other combination variable, however, showed a marginal effect of the window manipulation in the predicted direction. Attributive adjectives were marginally less frequent in the Window condition than in Writing ($\underline{F}$ (1, 45) = 3.32, MSE = 8.71, $\underline{p}$ < .08), though still significantly more frequent than in baseline speech ($\underline{F}$ (1, 45) = 7.18, MSE = 18.86, $\underline{p}$ < .05).

Although the overall effects of the window manipulation were weak, it is interesting that one combination variable was significantly affected and one other variable was marginally affected by the manipulation, both in the predicted

Table 14

Average frequencies of Situational variables per 100 words, Study 2.

Variable	Mean	S.D.
contractions		
5 minute spoken	3.26	(1.29)
window	0.32	(0.54)
written	0.23	(0.29)
filler words		
5 minute spoken	0.37	(0.49)
window	0.00	(0.00)
written	0.00	(0.00)
1st person pronouns		
5 minute spoken	0.61	(0.58)
window	0.07	(0.14)
written	0.08	(0.15)

Note. N = 16 per condition.

Table 15

Average frequencies of Combination variables per 100 words, Study 2.

Variable	Mean	S.D.
attributive adjectives		
5 minute spoken	5.98	(1.17)
window	7.52	(1.84)
written	8.56	(1.76)
conjoining		
5 minute spoken	1.06	(0.60)
window	0.89	(0.44)
written	1.40	(0.49)
hesitations		
5 minute spoken	6.00	(2.95)
window	0.00	(0.00)
written	0.00	(0.00)
nominalizations		
5 minute spoken	0.86	(0.70)
window	1.80	(0.85)
written	2.06	(1.29)
passives		
5 minute spoken	0.68	(0.29)
window	1.19	(0.78)
written	1.38	(0.69)
prepositions		
5 minute spoken	10.42	(1.50)
window	11.89	(1.64)
written	11.28	(1.81)
sequences of prepositions		
5 minute spoken	0.51	(0.38)
window	1.22	(0.52)
written	1.52	(0.74)

Note. N = 16 per condition.

direction. Both of these variables were previously shown to be susceptible to the presence or absence of prior planning, so it is clear that these variables can be affected by a cognitive manipulation. That they were affected selectively by this second cognitive manipulation means that those modest effects that have appeared in this study are unlikely to be chance findings, and that perhaps a stronger instantiation of the manipulation would strengthen the effect. Such a version of the study could take the form of a computer-operated experiment, in which the size of the window could be systematically manipulated.

No other combination variables showed significant differences between the Written and Window conditions. Prepositions showed no differences over all three conditions (F (2, 47) = 2.91, MSE = 2.92, p < .07), so contrasts were not examined. Examination of planned contrasts showed that nominalizations did not differ significantly in the Window condition from baseline Written (F < 1), and maintained the typical higher value relative to Spoken (F (1, 47) = 7.88, MSE = 7.62, p < .01). Likewise, use of sequences of prepositions was the same in the Window and Written conditions (F(1, 45) = 2.35, MSE = 0.76. p < .14), and was significantly different in the Window and Spoken conditions (F(1, 45) = 12.53 MSE = 4.03. p < .001). Similarly, use of passives in the Window condition did not differ from baseline Written (F < 1) and was significantly different from baseline Spoken (F(1, 45) = 5.21, MSE = 2.03. p < .05). Hesitations, which should not have shown any difference between the No Plan Written and Window conditions, did not (F < 1), and the difference between the Window and Spoken conditions was, of course, significant (F(1, 45) = 99.35, MSE = 288.42, p < .0001).

Because the findings for the syntactic variables in this study were weak overall, it could just be that the ability to review work in progress is, in fact, relatively unimportant to writers, at least in everyday writing. Other researchers' failures to find any effect of limiting review and editing (even with other, less quantitative criteria for successful effects, like "quality" of the texts) suggest that this may be the case (Higgins, 1978).

Content variables Content data are shown in Table 16. The MANOVA over all content variables in Study 2 showed a multivariate difference among the three conditions (Hotelling-Lawley Trace $\underline{F}$ (6, 84) = 6.75, $\underline{p}$ < .0001).

The findings for content in Study 2 were even less remarkable than those for syntax. Rules per 100 words showed a significant univariate difference among conditions ($\underline{F}$(2, 45) = 19.04, MSE = 0.36, $\underline{p}$ < .0001, but no significant contrast between Window and Written ($\underline{F}$(1, 45) = 1.38, MSE = 0.50, $\underline{p}$ < .25). The univariate ANOVAs for strategies and rules showed no overall differences: strategies per 100 words ($\underline{F}$(2, 45) = 1.67, MSE = 0.19, $\underline{p}$ < .20); Duke-specific ideas per 100 words ($\underline{F}$ < 1).

Total ideas per 100 words and total ideas per five minutes mimicked the pattern of rules per 100 words, with significant univariate differences among conditions (total ideas per 100 words: $\underline{F}$(2, 45) = 18.90, MSE = 0.51, $\underline{p}$ < .0001; total ideas per five minutes: $\underline{F}$(2, 45) = 276.47, MSE = 3.32, $\underline{p}$ < .0001), but no significant contrasts between the Window and Written conditions (both $\underline{F}$s < 1).

Clearly the content variables are unaffected by the cognitive manipulation of restricted access to previous utterances.

Table 16

Means and standard deviations of content variables in Study 2.

Variable	Mean	S.D.
total ideas/100 words		
5 minute spoken	2.34	(0.54)
window	3.74	(0.80)
written	3.61	(0.77)
rules / 100 words		
5 minute spoken	1.92	(0.50)
window	3.17	(0.76)
written	2.92	(0.50)
strategies / 100 words		
5 minute spoken	0.30	(0.16)
window	0.44	(0.33)
written	0.52	(0.46)
Duke ideas / 100 words		
5 minute spoken	0.11	(0.13)
window	0.13	(0.21)
written	0.17	(0.29)

Note. N = 16 per condition.

Summary

A manipulation with expected cognitive effects failed completely to affect any of the variables categorized as affected by cognitive constraints. This is problematic for the inclusion of these variables in such a category, especially considering that it is the second failure of two attempts to manipulate cognitive factors to influence these variables. This issue will be discussed further in the General Discussion.

Given the clear effect of the window manipulation on one combination variable and the marginal effect on another, a stronger manipulation of this type, perhaps with a smaller window, might be expected to affect more of these variables or at least to affect the marginal ones more clearly.

There were no observable differences in content as a result of the window manipulation.

One other fact about the results of Study 2 is noteworthy. The window condition, while it produced few syntactic changes in writing toward resembling speech, did at least replicate the basic findings of Study 1. The variables in this study that failed to move away from writing and toward speech did not in any way appear random; rather, they were consistently in the same direction and magnitude as in the written conditions of Study 1, supporting the notion that the general findings about syntactic features of writing are robust and replicable.

STUDY 3: Manipulating style

Study 1 examined cognitive processing constraints by manipulating prior planning, thereby varying the cognitive processing load faced (mostly) by speakers. Study 2 examined another aspect of cognitive processing constraints in language production by theoretically increasing the memory load of writers. In contrast, Study 3 examines which variables are affected not by cognitive constraints but by the choices people make, whether speaking or writing, about their language use. By asking subjects deliberately to alter the style of either speech or writing to resemble the other form of language, one can find out which characteristics they are able (and willing) to control when they are asked. If there is a strong distinction between cognitive effects and situational effects, then one would expect only the situation and combination variables to be affected by this manipulation. The variables hypothesized to be affected only by processing constraints should not be affected at all by a direct manipulation of language style.

Method

Subjects. There were 16 subjects per condition.

Procedure. Subjects were asked, using the same basic instructions as before, to explain the game of basketball. However, additions were made to the instructions compared to those of Study 1. In Study 3, Speakers were told that their audience was a diplomat (i.e., a person of high status), while Writers were told that their audience was a potential foreign exchange student (i.e., a peer). Pilot studies of this task suggested that subjects would not change their language with this manipulation of audience alone. Therefore, in order to give the subjects every opportunity to change their language, the instructions were made "blatant."

The "blatant style" instruction was added to the end of the core instructions

and repeated again just before subjects began speaking or writing. In this additional instruction, Writers were asked to make their writing as speech-like as possible, so that it would resemble a spontaneous monologue. Speakers were asked to make their speech as written-like as they could, so that a transcript of their speech would look like a prepared essay.

Predictions. The expected outcome of this study is that writers who write as if they are speaking (Blatant Written condition) should produce, for example, more contractions and first person pronouns as well as fewer nominalizations and conjoining constructions than ordinary Writers. Coordination and informal hedges should remain unchanged, although Writers aware of these characteristics of speech could conceivably use them. Speakers who speak as if they are writing (Blatant Spoken condition), on the other hand, should produce fewer contractions and first person pronouns, more nominalizations and conjoining, and the same number of coordinating constructions and hesitations as ordinary speakers. Predictions for all syntactic variables are shown in Table 17.

The strongest evidence for the contention that only stylistic choice affects the distribution of a particular variable in speech and writing would be a cross-over interaction of Instructions by Mode for that variable, as speakers and writers both manage accurately to mimic the style of expression of the other mode. Non-cross-over interactions, however, would also support the general notion that stylistic choice contributes, at least in part, to the distribution of a given variable in speech and writing.

Results and Discussion

The comparison groups for this study, as in Study 2, were the 30-minute

Table 17

Predicted effects of Blatant Style manipulation on syntactic variables in Study 3, by cause group.

Variable	Prediction
Cognitive variables	
coordination	no change
inexplicit 3rd person reference	no change
informal hedges	no change
Situational variables	
contractions	BW increase, BS decrease
filler words	BW increase, BS decrease
1st person pronouns	BW increase, BS decrease
Combination variables	
attributive adjectives	BW decrease, BS increase
conjoining	BW decrease, BS increase
hesitations	BW increase, BS decrease
nominalizations	BW decrease, BS increase
passives	BW decrease, BS increase
prepositions	BW decrease, BS increase
sequences of prepositions	BW decrease, BS increase

Note. BW = Blatant Written. BS = Blatant Spoken.

Written condition (No Plan) and the 5-minute Spoken condition (No Plan).

Blatant Speakers produced an average of 642.06 (s = 127.58) words, compared to Regular Speakers' 721.37 (s = 149.78) words, Blatant writers' 617.00 (s = 115.55) words and Regular Writers' 571.31 (s = 127.75) words. There was a main effect of Mode (F (1, 60) = 7.18, MSE = 122675.06, p < .01) and a marginal interaction of Instructions by Mode (F (1, 60) = 3.66, MSE = 62500.00, p < .07).

The results of this study show that, overall, stylistic choice, as influenced by situational factors, appears to be a large part of the causes for some of the differences between typical speech and writing. (Based on the first two experiments, however, stylistic choice is clearly not the whole story). The following discussion shows a wealth of interactions of Instructions by Mode, even in the category of cognitive variables; style instructions are clearly a powerful manipulation. Furthermore, contrary to what a cognitive-constraints view might predict, it is mostly the speakers who change their language use in the direction of interaction, not the writers. For a more detailed discussion of interactions of Mode and Instructions for particular variables, please see Appendix D, Post-hoc Analyses of Interactions.

Cognitive variables. Results for the cognitive variables are shown in Table 18.

Overall, the MANOVA showed that there were significant main effects of Mode (Hotelling-Lawley Trace F (3, 58) = 15.98, p < .0001), Instructions (Hotelling-Lawley Trace F (3, 58) = 2.89, p < .05), and an interaction of Mode X Instructions (Hotelling-Lawley Trace F (3, 58) = 3.91, p < .05) for the cognitive

Table 18

Average frequencies of Cognitive variables per 100 words, by Instructions and Mode, Study 3.

| | Instructions | | | |
| | Regular | | Blatant style | |
Variable	Mean	S.D.	Mean	S.D.
coordination				
5 minute spoken	1.54	(1.02)	2.18	(0.71)
written	0.71	(0.46)	1.02	(0.51)
inexplicit 3rd per. ref.				
5 minute spoken	1.91	(0.93)	1.55	(0.74)
written	0.77	(0.56)	1.22	(0.52)
informal hedges				
5 minute spoken	0.12	(0.23)	0.01	(0.03)
written	0.00	(0.00)	0.01	(0.04)

Note. N = 16 per condition.

variables.

The categorization of the cognitive variables is gravely in doubt considering the results of Study 3 alone. The variables in this category should not have shown any effect of Instructions, yet two out of the three cognitive variables under consideration showed interactions with Instructions. This suggests that these variables are influenced by situational factors, and thus that their use is partly a matter of stylistic choice.

Although there was no main effect of Instructions on informal hedges ($\underline{F}(1, 60) = 2.75$, MSE $= 0.04$. $\underline{p} < .11$), the variable did show an unexpected marginal interaction of Mode by Instructions ($\underline{F}(1, 60) = 3.85$, MSE $= 0.06$, $\underline{p} < .06$) and also failed, marginally, to show the expected main effect of Mode ($\underline{F}(1, 60) = 3.81$, MSE $= 0.05$, $\underline{p} < .06$). It is interesting that one subject in the Blatant Written condition produced one informal hedge (yielding an overall condition mean of .01 informal hedges per 100 words, compared to baseline writers' mean of 0 informal hedges per 100 words). Meanwhile, Blatant Speakers reduced their production of informal hedges, bringing it also to the level of .01 informal hedges per 100 words. The behavior of both Blatant groups, but especially the speakers, suggests that Chafe and Danielowicz (1987) may have misinterpreted the use of this type of construction as a cognitive support or compensation device, and at the least, this variable does not belong in the category of pure cognitive variables. The implications of the result for this variable in this study, when combined with that from Study 1, will be taken up further in the General Discussion.

Inexplicit third person references showed both a main effect of Mode ($\underline{F}(1, 60) = 17.37$, MSE $= 8.72$, $\underline{p} < .0001$), with more inexplicit third person

reference in speech than in Writing, and an interaction of Mode by Instructions (F (1, 60) = 5.26, MSE = 2.64, p < .05), but no main effect of Instructions.

Inexplicit third person reference appears by the results of this study to belong in a different category. The interaction of Mode by Instructions suggests that subjects could exercise some, though not complete, control over their use of this construction. Therefore, the original placement of inexplicit third person references in the cognitive category is unfounded.

Coordination showed the expected main effect of Mode (F (1, 60) = 31.30, MSE = 15.84, p < .0001), with more coordination in speech than in Writing and a main effect of Instructions (F(1, 60) = 7.04, MSE = 3.56. p < .05). There was no interaction (F < 1). Strangely, Blatant Speakers appear to increase their use of coordination relative to baseline speech (rather than decrease it), and Blatant Writers decrease their use of coordination relative to baseline writing (rather than increase it). Thus the effects of instructions are difficult to interpret in terms of the predictions.

Situational variables. Mean frequencies of Situational variables per 100 words are shown in Table 19.

All three situational variables performed as expected, showing interactions of Instructions with Mode. The placement of the variables in this category seems appropriate.

There was no multivariate main effect of Instructions (Hotelling-Lawley Trace F (3, 58) = 1.51, p < .22), but the expected main effect of Mode appeared (Hotelling-Lawley Trace F (3, 58) = 20.29, p < .0001), as did the expected interaction of Instructions X Mode (Hotelling-Lawley Trace F (3, 58) = 3.30, p < .05).

Table 19

Average frequencies of Situational variables per 100 words, by Instructions and Mode, Study 3.

| | Instructions | | | |
| | Regular Blatant style | | | |
Variable	Mean	S.D.	Mean	S.D.
contractions				
5 minute spoken	3.26	(0.29)	2.46	(1.76)
written	0.23	(0.29)	0.96	(0.91)
filler words				
5 minute spoken	0.37	(0.49)	0.15	(0.15)
written	0.00	(0.00)	0.04	(0.15)
1st person pronouns				
5 minute spoken	0.61	(0.58)	0.46	(0.33)
written	0.08	(0.15)	0.50	(0.66)

Note. N = 16 per condition.

First person pronouns showed the expected interaction of Instructions by Mode (F (1, 60) = 5.69, MSE = 1.28, p < .05), as did contractions (F (1, 60) = 6.62, MSE = 9.44, p < .05). Both of these situational variables also showed main effects of Mode. Spoken texts overall contained more first person pronouns (F (1, 60) = 4.15, MSE = 0.93, p < .05) and contractions (F (1, 60) = 57.37, MSE = 81.84, p < .0001) than Written texts overall.

Filler words showed both a main effect of Mode (F (1, 60) = 12.56, MSE = 0.89, p < .001) and a marginal interaction of Mode by Instructions (F (1, 60) = 3.92, MSE = 0.28, p < .06). Unfortunately, the lack of a truly significant interaction does not allow the examination of post-hoc tests of any interesting individual cell differences for this variable. However, it is interesting to note that the mean use of filler words for writers trying to mimic speech was not zero; two Writers of 16 in the Blatant condition used filler words in their attempts to mimic spoken style (one used filler words five times and the other once, for a mean of 0.04 filler words per 100 words in the Blatant Written condition, compared to 0/100 words in the Regular Written condition). This suggests not only a conscientious attempt to follow instructions by these two subjects, but an also awareness that such constructions are a part of a typical spoken style (at least with a peer).

Combination variables. Mean frequencies of Combination variables per 100 words are shown in Table 20.

The combination variables also, for the most part, performed as predicted in Study 3. Nominalizations and passives were not at all influenced by Instructions. Two other combination variables, however, showed distributions that are at least consistent with, though not strongly in support of, their being affected by situational

Table 20

Average frequencies of Combination variables per 100 words, by Instructions and Mode, Study 3.

| | Instructions | | | |
| | Regular Blatant style | | | |
Variable	Mean	S.D.	Mean	S.D.
attributive adjectives				
5 minute spoken	5.98	(1.17)	7.68	(1.27)
written	8.56	(1.76)	7.93	(1.70)
conjoining				
5 minute spoken	1.06	(0.60)	1.44	(0.60)
written	1.40	(0.49)	1.62	(0.70)
hesitations				
5 minute spoken	6.00	(2.95)	3.68	(2.75)
written	0.00	(0.00)	0.01	(0.03)
nominalizations				
5 minute spoken	0.86	(0.70)	1.05	(0.63)
written	2.06	(1.29)	1.68	(0.88)
passives				
5 minute spoken	0.68	(0.29)	0.90	(0.57)
written	1.38	(0.69)	1.28	(0.58)
prepositions				
5 minute spoken	10.42	(1.50)	11.30	(1.78)
written	11.28	(1.81)	10.57	(1.70)
sequences of prepositions				
5 minute spoken	0.51	(0.38)	1.34	(0.60)
written	1.52	(0.74)	1.00	(0.43)

Note. N = 16 per condition.

constraints, that is, by the stylistic choice of the communicator. The remaining three showed clear results in favor of that hypothesis.

Overall, MANOVAs showed a main effect of Mode on the combination variables (Hotelling-Lawley Trace $\underline{F}$ (7, 54) = 16.53,$\underline{p}$ < .0001) as well as a significant interaction of Mode X Instructions (Hotelling-Lawley Trace $\underline{F}$ (7, 54) = 4.57,$\underline{p}$ < .001). There was no multivariate main effect of Instructions (Hotelling-Lawley Trace $\underline{F}$ (7, 54) = 1.34,$\underline{p}$ < .25). As before when a multivariate effect was lacking, only the main effect of Mode and the interaction of Mode X Instructions will be explored further for individual variables.

Nominalizations showed a main effect of Mode only ($\underline{F}$ (1, 60) = 17.76, MSE = 14.35, $\underline{p}$ < .0001), with more nominalizations in Written than in spoken groups, and no interaction ($\underline{F}$ (1, 60) = 1.29, MSE = 1.04, $\underline{p}$ < .27). The only conclusion to be made from this is that, when topic is held constant, other situational factors are probably not very important in the choice of vocabulary. The overall constellation of effects on nominalizations, including cognitive ones, will be taken up in the General Discussion.

Passives also failed to be affected by instructions, showing only a main effect of Mode ($\underline{F}$ (1, 60) = 15.29, MSE = 4.65, $\underline{p}$ < .001) and no interaction ($\underline{F}$ (1, 60) = 1.33, MSE = 0.40, $\underline{p}$ < .26). One explanation could be that the passive voice, while a feature of much writing, is a construction whose use is actively discouraged in Duke's University Writing Course for undergraduates. Therefore, it is conceivable that Speakers in this study would not attempt to use passive voice when mimicking Writing. Why Writers would not therefore avoid the construction in their texts, particularly under instructions to produce Writing that resembles

speech, is unclear.

Conjoining produced another unusual finding. There was no overall significant univariate F for conjoining, despite the robust findings in Study 1. It is possible that the two Blatant conditions, which appear by inspection to yield numbers in between those of the two regular conditions, moved performance just enough for the overall ANOVA to show no significant main effects, but not enough to show a significant interaction. If indeed that is a valid interpretation, then situational constraints may have some influence on conjoining after all.

Prepositions showed no significant differences among conditions over all (F (3, 62) = 1.71, MSE = 3.01, p < .18). As with conjoining, it could be that subjects in the Blatant style conditions changed their language use just enough to eliminate any main effects on prepositions, though not enough to yield a significant interaction.

All three of the remaining combination variables showed both main effects of Mode in the expected direction and significant interactions of Mode by Instructions.

The results for sequences of prepositions support a situation-based cause hypothesis. Overall, there were more sequences of prepositions in writing than in speech (F (1, 60) = 6.34, MSE = 1.99, p < .05). There was also an interaction of Mode X Instructions (F (1, 60) = 22.51, MSE = 7.08, p < .0001).

There were more attributive adjectives in writing than in speech (F (1, 60) = 14.26, MSE = 32.02, p < .001), and a significant interaction of Mode by Instructions (F (1, 60) = 9.65, MSE = 21.67, p < .01).

Attributive adjectives' pattern of interaction is consistent with a variable that is affected by situational constraints, at least to the extent that Speakers, if not

Writers, change their language behavior to meet instructions (see Appendix D).

Blatant Speakers used enough attributive adjectives to distinguish themselves from

Regular Speakers, and to be equivalent in the use of attributive adjectives to both

groups of writers. The force of the interaction comes from the behavior of Blatant

Speakers only (see Appendix D).

More hesitations appeared in speech than in writing ($\underline{F}$ (1, 60) = 92.92,

MSE = 395.63, $\underline{p}$ < .0001). There was also an interaction of Mode by

Instructions ($\underline{F}$ (1, 60) = 4.00, MSE = 17.03, $\underline{p}$ < .05). As in the case of filler

words, there were hesitations in the writing of Blatant Writers (added by one

subject) in the attempt to mimic speech. Of course, this single subject's behavior

did not allow the difference to reach significance compared to Regular Written in

post-hoc tests. As was the case for attributive adjectives, it was a change in the

language behavior of Blatant Speakers that caused the interaction. Blatant Speakers

reduced their use of hesitations to a level significantly less than that of Regular

Speakers (by Tukey test; see Appendix D), though never quite reaching the level of

writers.

The behavior both of Speakers (who were able to remove many of their

hesitations) and of Writers (one of whom tried to add hesitations) on this variable

supports the contention of Deborah Tannen (1987) that in many cases hesitations

and other apparent "dysfluencies" may not be dysfluencies at all but, at least in part,

a deliberate aspect of conversational style designed to create rapport.

Content variables. The results for the content data appear in Table 21.

Overall, the content variables showed a multivariate main effect of Mode

(Hotelling-Lawley Trace $\underline{F}$ (3, 58) = 10.70, $\underline{p}$ < .0001), but no main effect of

Instructions (Hotelling-Lawley Trace $\underline{F}$ (3, 58) = 1.18, $\underline{p}$ < .33), nor any

Table 21

Means and standard deviations of Content variables by Instructions and Mode, Study 3.

| | Instructions | | | |
| | Regular | Blatant style | | |
Variable	Mean	S.D.	Mean	S.D.
total ideas/100 words				
5 minute spoken	2.34	(0.54)	2.47	(0.42)
written	3.61	(0.77)	2.95	(0.69)
rules / 100 words				
5 minute spoken	1.92	(0.50)	2.06	(0.38)
written	2.92	(0.50)	2.48	(0.74)
strategies / 100 words				
5 minute spoken	0.30	(0.16)	0.29	(0.21)
written	0.52	(0.46)	0.40	(0.26)
Duke ideas / 100 words				
5 minute spoken	0.11	(0.13)	0.12	(0.13)
written	0.17	(0.29)	0.08	(0.21)

Note. $N = 16$ per condition.

interaction of Instructions X Mode (Hotelling-Lawley Trace $\underline{F}$ (3, 58) = 2.16, $\underline{p}$ < .11).

For rules per 100 words, there was a main effect of Mode ($\underline{F}$(1, 60) = 26.49, MSE = 7.95, $\underline{p}$ < .0001), with more rules per 100 words in writing than in speech.

There was no univariate difference among conditions for strategies per 100 words ($\underline{F}$(3, 60) = 2.11, MSE = 0.19, $\underline{p}$ < .11) or for Duke-specific ideas per 100 words ($\underline{F}$ < 1). Therefore no main effects of Mode were examined for these variables.

As in the first two studies, total ideas per 100 words and total ideas per five minutes were not included in the MANOVA but were examined with an adjusted alpha (where alpha = .17). There was a main effect of Mode on ideas per 100 words ($\underline{F}$(1, 60) = 32.11, MSE = 12.36, $\underline{p}$ < .0001) and also an interaction of Mode X Instructions ($\underline{F}$(1, 60) = 6.50, MSE = 2.50, $\underline{p}$ < .013), which is significant even under the Bonferroni adjustment to alpha. There was no main effect of Instructions ($\underline{F}$(1, 60) = 2.93, MSE = 1.13, $\underline{p}$ < .10).

Tukey tests of the interaction on total ideas per 100 words show that Regular Writers produced more ideas per 100 words uttered than any other group. Blatant writers, while still producing significantly more ideas than Regular Speakers, produced a statistically equivalent number to that produced by Blatant Speakers. Blatant and Regular Speakers did not differ from one another. Thus there appears to be a style effect on content.

One possible explanation put forth in the past for the efficiency effect is that speakers utter more words than writers in general because speech is less

cumbersome than writing, with less effort expended per extraneous word. To put it colloquially, talk is cheap. Relative effort may be part of the explanation, as speakers do not change their per-word communicative efficiency under style instructions.

However, the style manipulation had its effect on the Blatant writers, not on the speakers. In the course of trying to make their writing resemble speech, Blatant writers made their communication less efficient than normal writing, whereas Blatant Speakers did not (perhaps could not) increase the efficiency of their speech to resemble that of writing, or even to differentiate it from baseline speech. What could be causing this reaction to the style instructions?

One possibility is that the efficiency difference under style instructions is an artifact of the effects of the style manipulation on syntax. The changes in hesitations, for example, could partly account for the change in efficiency. However, it was noted before that in all cases, differences in syntax under Blatant style instructions arose not from the writers' behavior, but from the speakers' changes in syntax, such as reducing hesitations. Although one Blatant writer used hesitation phenomena in his attempt to mimic speech, that could not account for this difference in efficiency. Here, writers changed their efficiency under style instructions, whereas speakers did not.

Perhaps the "natural" condition of language production is verbosity, and writers normally edit extraneous words out of their writing, possibly at a stage before moving the pen. Such editing could occur because of the relative effort of writing or out of consideration for the reader's time, or just because it is the way writing is to be done. For whatever reason, if this were true, one could say that writing has a demand characteristic discouraging verbosity. The style manipulation

changed that demand characteristic, allowing or encouraging writers to be more verbose.

Total ideas per five minutes showed only a main effect of Mode ($\underline{F}(1, 60) = 517.93$, MSE $= 2626.56$, $\underline{p} < .0001$; other $\underline{F}$s < 1), with more ideas expressed per five minutes of speech than per five minutes of writing. This replicates the findings for Mode from the first two studies.

Summary

Overall, the blatant style instructions were a powerful manipulation, changing many aspects of language behavior. Two of three cognitive variables, which should have been unaffected by stylistic choice, were affected by style instructions. Furthermore, all three situational variables and five of seven combination variables all performed in a manner consistent with an effect of style instructions. However, when one considers the effects of the cognitive manipulations in the first two studies, it is clear that this powerful shaper of language, stylistic choice, is not all there is to the picture.

Interestingly, for many of the variables, the observed interactions of Instructions with Mode on syntactic variables in this study came solely from the changes in behavior of speakers, rather than of writers, as one might expect. This shows something about the ultimate flexibility of the spoken mode as well as, possibly, the overwhelming effects of stylistic training with regard to writing. Even though the cognitive evidence suggests that writers are in a much better position than are speakers, from the standpoint of time and cognitive capacity, to be flexible and creative with their use of syntax, they do not maximize those resources in Study 3. Perhaps because writing has a rather limited set of generally acceptable expressions and syntactic forms relative to those that can be used without censure in

speech, writers find it difficult to exercise the freedom given them in this study to break the stylistic rules that have been so well trained into them with regard to writing.

The interaction of Mode and Instructions on ideas expressed per 100 words suggested that, beyond the effect of stylistic rules on how an utterance is formed (syntax), some aspects of what is uttered (content) also are influenced by stylistic demands.

GENERAL DISCUSSION

Each of the present studies had two major purposes: to explore as far as possible the contribution of a particular factor to the distribution of the various syntactic variables in typical cases of speech and writing and to be a piece of a larger set of convergent evidence about the simultaneous influence of cognitive and situational factors on a whole set of characteristics of speech and writing. Thus each study is like a piece of the larger puzzle, though there is a discernible pattern on each individual piece as well. In addition to evaluating the role of various factors in the production of different constructions in speech and writing, the data will be used to make an argument that the oral-written distinction is a real one, and not just an artifact of the confounding of different situational factors with mode under typical circumstances.

The categories of causes

Let us turn first to an examination of the categories and the variables studied, based not on one manipulation but on the pattern of results in all three experiments.

Some of the variables are as yet unclassifiable according to experimental results. Because of the patterns of results obtained in these three experiments, it is

difficult to classify coordination, prepositions, or passive constructions. Perhaps the future experiments manipulating speed will shed further light on the classification of these variables.

Cognitive variables. None of the five variables originally postulated to belong in this category really seem to belong here. Relative clauses and type-token ratio showed no reliable pattern even for the basic mode differences, so there was no oral-written difference to explain. Coordination was never affected in an interpretable by any stylistic or cognitive manipulation, so its causes are still unclear.

Informal hedges was affected only by the style manipulation of Study 3, so it cannot be a cognitively-caused variable. Inexplicit third person reference was influenced both by Planning in Study 1 and by the Blatant Style manipulation of Study 3, a result which places it squarely in the combination category.

The only variable in the whole set that appears to fit into the category of pure cognitive constraints, if the category should exist at all, is nominalizations, which was originally classified under combination variables. The distribution of nominalizations in speech and writing was affected by planning in Study 1 and unaffected by stylistic choice in Study 3.

Situational variables. In the situational category go all three variables that were originally classified there, contractions, first person pronouns, and filler words. Added to this set is informal hedges, which seems to be a rapport-creating device used in some informal situations, yet easily dispensed with when its use is deemed inappropriate.

Given that all three variables hypothesized to have situational causes, and one more, in addition, showed patterns of results consistent with a situational

variables category, it is extremely probable that stylistic choice is one valid, and perhaps sole, cause for some differences between speech and writing. At least for this small set of variables, it appears to be largely situations that determine their use. Apparent oral-written differences among these variables seem to be primarily the result of confounding situational (stylistic) factors with mode, although the lack of a complete cross-over interaction makes it impossible to rule out completely other influences, like long-standing habit or adaptation to audience demands (the issue of factors not addressable by this investigation will be taken up again later).

Combination variables. This category started out with the highest number of constructions, and despite some unconvincing findings for three of seven variables, this category remains the largest. Although the results for prepositions and passives were equivocal and those for nominalizations may favor a cognitive explanation (if any is tenable), the rest of the variables in this group fit a combination explanation. Conjoining, attributive adjectives, sequences of prepositions and hesitations all were influenced by at least one cognitive manipulation and by the Blatant Style manipulation in ways that support, or at least fail to refute, the influences of both situational and cognitive factors.

There is also one addition to the category. Use of inexplicit third person reference, a variable originally included in the cognitive category, was increased by lack of planning in the five minute spoken condition of Study 1 and showed an interaction of Instructions by Mode in Study 3. These findings clearly argue for the inclusion of inexplicit third person reference as a combination variable.

The dual influences of cognitive and situational factors on the combination variables suggest that, while strategies or stylistic choice related to situational factors are clearly important, the underlying processes of producing speech and

writing lead to cognitive differences that also influence the use of these constructions.

Content variables. The content measures, being more exploratory than anything else, nonetheless fit nicely into the emerging picture of the interaction of cognitive factors with stylistic demands to determine the nature of utterances. Not only is the linguistic form of an utterance influenced both by style and by cognitive factors, but the substance is affected by this combination of factors as well.

Speakers are more efficient per unit time at producing ideas, but when the unit is ideas per 100 words, writers are more efficient. These differences in efficiency seem attributable in part to the speed of speech relative to writing. Speakers can produce language on average six times as fast as writers, and they do produce more ideas per unit time. But writers generally produce more ideas (at least more ideas as defined in succinct units) per 100 words, suggesting that, in addition to differences already noted in syntactic redundancy, writers express fewer details in the course of making an explanation. When asked explicitly to mimic speech, however, writers do so in their content, more than in their syntax. Whereas syntactic differences based on style instructions were always attributable to changes in the behavior of speakers, content differences resulted from changes in the behavior of writers.

Generalizability

One might argue that the studies here are not easily generalizable to the population at large, in part because of the choice of only one sex as subjects and in part because the subjects all came from a population that is highly verbal, on average. Both of these concerns are justifiable, and it is true that this population is not representative of most speakers of American English, but it is nonetheless

interesting to note the following facts:

1. The spoken-written differences usually noted in the literature were confirmed, with the exception of type-token ratio and relative clauses. In that respect my sample was like most others that have been studied so far.

2. Although the subjects were all males, and therefore according to sociolinguists less likely than females to use hesitations and fillers in their speech (e.g., Lakoff, 1975; Tannen, 1981), there are quite a few hesitations and fillers in the language produced here.

3. Duke undergraduates score high on tests of verbal ability (average Verbal SAT for the class entering in the Fall of 1991 = 617; 1992 = 616). This could be part of the reason behind some of the unusual findings in this investigation, such as the failure of the window manipulation to affect very much of the language production of these subjects. Duke undergraduates may be sufficiently skilled as producers of language not to be bothered by slight inconveniences regarding access to their preceding utterances. Nonetheless, the performance of even these highly verbal subjects was affected by the Plan manipulation, and that effect might be expected to be even more robust for a less verbally facile group. Rather than the outcome of the study being dependent on the high verbal ability of the subjects, and therefore relevant only to other highly verbal populations, it seems more likely that the effects of at least the cognitive manipulations are underestimated; the cognitive-based differences found here might be exaggerated in a population with lower verbal ability.

Another issue related to generalizability has to do with the controlled methods used in this investigation. The spoken subjects, in particular, were necessarily put in an artificial situation for producing language, in order to avoid the

possibility of "Clever-Hans effects," which can appear in the presence of an experimenter even in the absence of direct verbal feedback. Nods, gaze, and other gestures (i.e., back-channel responses) are also responses that can affect behavior (e.g., Goodwin, 1981), and even the lack of an overt response to an utterance is a form of response in itself. If, in the interest of keeping the speech context as natural as possible, the audience was not to be the experimenter but someone else, who should that have been? And should that person's behavior have been regulated in any way? Should it have been a person of the same or opposite sex? A novice or an expert on basketball? To avoid adding all these issues, I made the audience absent and imaginary.

In the interest of control, I chose to create this artificial speaking environment, which could be criticized as having nothing to do with any natural speaking situation. However, the situation is not as unnatural, or at least not as uncommon, as it sounds. With the technology that has become commonplace today, people do in fact make frequent tape-recorded monologues with no audience present to respond. Dictaphones are one example of such technology, although the use of these machines implies entry into a written style, as the usual purpose of dictation is to produce a written text. Another example of such technology, which comes much closer to the situation of tape recording for an absent audience without the expectation of later transcription into writing, is the use of the now ubiquitous telephone answering machines (and also voice mail). With the pervasiveness of this technology, most people have become accustomed to leaving at least brief spoken messages on such recording devices, and many even leave extensive messages of a length similar to that of some of the spoken explanations produced in this investigation. Thus producing an extended spoken monologue for an absent

audience is not as distant from reality as it sounds. At worst, the potential artificial nature of the speech produced in this investigation is such that the speech produced becomes decontextualized and more like writing than like natural speech. This would only serve to minimize the mode differences observed, which were, as noted many times by now, extremely robust.

Implications of the investigation

Many different and useful types of detailed information came out of this investigation, regarding both specific and general contributions of cognitive and stylistic factors to the linguistic form of speech and writing. Another important, more global contribution is the demonstration of the general usefulness of a psychological approach to questions that before were largely seen as the domain of linguists (at least by default, since few psychologists have tackled the problem). Although naturalistic studies using samples of speech and writing produced under everyday circumstances are important and necessary for defining the phenomenon and enumerating the differences between speech and writing, an experimental psychological approach, emphasizing both control and systematic manipulation, is important for explaining why the differences exist. This investigation is a step toward such an explanation and toward development of methods for exploring the problem.

Having used an experimental approach to tentatively re-categorize a set of syntactic variables that differ in speech and writing into new cause categories, what else can be said in a more general way about the findings of this study?

First, at least for most of the variables examined in this study, it is clear that the findings in the various naturalistic studies comparing the syntax of speech and writing are not simply artifacts of different situational conditions for production.

The subjects in this study wrote or spoke about the same topic, with the same imaginary audience, and for the same purpose, and yet clear oral-written differences emerged. Furthermore, the study was conducted between-subjects, which some students of individual differences may argue threatens the validity of the results; however, it is significant that such robust and replicable differences emerged between the two modes, in spite of, rather than because of, the statistical noise from averaging over individual verbal abilities and language styles.

Second, the study as a whole speaks to the issue of whether an oral-written language dimension is a valid one to discuss. One argument, best exemplified by recent work of Tannen in this area (e.g., Tannen, 1983; Chafe and Tannen, 1987), states that it is not the physical modes per se, but "oral and literate strategies," that determine linguistic form. Clearly, given the many and various influences on language use that appear in just the three experiments discussed in this study, there is more to determining the form of speech and writing than the employment of strategies, or stylistic choices. Deliberate instructions to subjects asking them to use one "style" of language or another were not sufficient to make writers look like speakers or speakers look like writers on most variables, although the Blatant groups approached the behavior of the mode to be mimicked on some variables. Furthermore, manipulations that held situational factors constant while changing cognitive constraints did affect the distribution of a number of constructions in the first two experiments. Therefore, I argue that there is a valid oral-written dimension that impacts linguistic form, and this dimension is reflected in the effects of cognitive manipulations. To the extent that unique cognitive effects on communicators stem from the processes (or modes) of speech and writing, those modes have unique consequences for the linguistic form of utterances produced by

people communicating in a given mode.

Third, it becomes clear when one thinks about the patterns of results in these three experiments that the studies in this area, particularly those carried out in departments of speech or rhetoric, have an inherent bias that cannot be overlooked, for it directly influences the concept of cognitive constraints. For this bias I coin the term "litero-centric," as the literature in this area emphasizes the advantages of the writer over the speaker, and, though with subtlety, the superiority of the written form to the spoken. In this view, speech is seen as dysfluent and impoverished. Writing on the other hand is viewed as coherent and more advanced. Differences in grammatical structure, such as the use of fewer inexplicit third person references in writing, are attributed largely to cognitive advantages inherent in the process of writing. However, the failure of the cognitive-only cause category as a whole (with the possible exception of nominalizations) combined with the flexibility of speakers in the Blatant condition of Study 3 contradicts the idea that writers have the ultimate flexibility while speakers are mere slaves to their cognitive capacities.

Another way to look at it might be that writers are required, rather than simply able, to be more specific. Writers avoid vague constructions like inexplicit third person references not just because they are able easily to do so, but because of the disadvantage of not having prosody and intonation to help convey meaning. One need not be so specific about pronouns, for example, if stress can help clarify the referent. So although it is true that speakers are at a cognitive disadvantage in producing certain constructions, that contention assumes that speakers ordinarily need or want to produce such constructions. If speakers can use paralinguistic features to disambiguate meaning with less regard to syntax than writers must use, then it is easier, and logical, for speakers simply to do that. Because the rules for

literate style are not generally relevant to speakers in everyday circumstances, it makes less difference precisely what structures speakers use to communicate, as long as meaning can be understood without undue difficulty. When the matter is looked at in this light, it is suddenly the writers who appear to have the cognitive disadvantage in communication, for their work is more restricted by prescriptive rules of grammar, and their assumptions, connections, and inferences must be made explicit. Writers' meaning must be lexicalized, rather than simply implied through a combination of syntax and paralinguistic features. Because of these constraints, the writer's task of producing unambiguous, comprehensible prose is thus made more difficult, as anyone who is struggling to write clearly in a paper can attest to.

The apparent flexibility of speakers relative to writers, despite any differences in cognitive constraints, became apparent in this investigation, particularly in Study 3. Speakers were, in all cases, responsible for part or all of the change in the frequencies of syntactic variables that led to significant interactions of Mode with Instructions. Blatant Speakers often used significantly fewer typically-oral constructions (like first person pronouns) than Regular Speakers, although Blatant Writers never truly differed from Regular Writers. It was as if writers, despite all the theoretical cognitive advantages that should allow them to be more flexible in their expression, did not know how to make use of those advantages.

Related to the issue of speaker flexibility is the idea of conversational style. Tannen (1989) argues that people use more dysfluencies in their speech than planning or lexical access would require. People do this deliberately, as a means of creating rapport, to avoid sounding untrustworthy or like a know-it-all (which suggests, too, that the term "dysfluencies" is something of a misnomer for these

phenomena). So when one talks about people's ability to remove "dysfluencies" from their speech, one is assuming that those "dysfluencies" serve only a time-filling and/or floor-holding function during cognitive processes like planning or formulating an utterance, and that they are unintentional interruptions in information transmission.

Although the cognitive functions of "dysfluencies" have been well documented, cognitive functions are clearly not the only functions fulfilled by these phenomena. The fact that people can, on demand, speak without dysfluencies, or with fewer of them (e.g., hesitations in Study 3), supports Tannen's idea that speakers not only do not bother to try to remove dysfluencies from ordinary speech, but they may even deliberately include such constructions in their language. As a naturalistic example, the choppy, interrupted style of Valley Speak ("and he was like, oh my God, you know, it was like we just like couldn't believe it, you know?"), which was most popular among teenagers in the early 1980's and can still be heard on the Duke campus, is probably a good example of speakers' using hesitations and other apparent time fillers as deliberate linguistic devices to signal group membership.

The data on content that were included in this study were largely exploratory, so there are not many grand conclusions to be drawn from the performance of those variables. One fact that does seem to emerge, however, is a difference in detail that may be a demand characteristic of the two modes. Speakers produced fewer ideas for all the extra words produced, but that may be a result of an emphasis on example and detail (whether helpful or extraneous), rather than a result of poverty of expression or lack of precision. In terms of time, speakers did communicate more ideas with increased time, although there were diminishing

returns with the longer production interval. The differences in efficiency per 100 words produced go along with, but cannot be explained by, differences in fluency as measured by the syntactic variables. Stylistic demands about what to include in an oral versus a written explanation seem to be the most plausible explanation for the observed efficiency effects.

The content of the subjects' explanations of basketball did not vary with the two cognitive manipulations included, but they may be affected by style, as shown in Study 3. Unlike the syntactic variables, the content variables were changed most by writers in response to instructions, rather than by speakers. Whether writers normally suppress details and examples or speakers normally make an effort to include them cannot be answered by these studies. What seems clear, however, is that investigators who want details from their respondents to surveys or other initial information-gathering tools (as in exploratory studies of autobiographical memory or in clinical work) should probably conduct their investigations as open-ended oral interviews, at least as a first step. Although speakers may give investigators more information than they want to know through such a technique, it would seem to be likely to yield a much richer source of information for studies in areas in which the issues have not yet been defined.

Finally, for all the discussion about the consequences for speakers and writers of cognitive differences between the two modes, one must note one limitation to these studies. The studies are not designed in any way to deal with the cognitive consequences of modality or linguistic form for those on the other end of the communication, the listeners or readers. To the extent that speakers and writers, consciously or not, try to shape the content and syntax of their utterances to the known or suspected abilities of the listener or reader, the cognitive capacities of

the audience will also have an effect on content and linguistic form that cannot be evaluated by the experiments presented here. The abilities of a particular current audience to comprehend a current communication affect the content expressed and the linguistic form of the speaker or writer in the immediate situation. In addition, the typical cognitive capacities of people in general may also be reflected in the formal and informal rules of good style that one learns in the course of becoming an effective communicator in any medium. Those rules and notions about good style may have appeared over time in a linguistic culture to reflect the general abilities of people to understand certain types of grammatical construction and rates of information presentation more easily than other types or rates.

Summary

The following are the major points of the study:

1) Naturalistic studies of speech and writing produced under everyday conditions are important for enumerating the differences between speech and writing. Control of production circumstances coupled with experimental manipulation of specific contributing or limiting factors affecting production are an important next step to show (1) what factors influence the distribution of specific individual constructions in speech and writing and (2) what factors in general influence patterns of linguistic form across modes.

2) Based on the results of the manipulations in these experiments, a new categorization of the tested syntactic variables was proposed (though a few variables remain uncategorizable for now). The only variable that may belong in a Cognitive cause category is nominalizations. Into the Situational cause category fall informal hedges, filler words, first person pronouns and contractions. But overall, most variables appear to belong in the Combination cause category. They are influenced

both by cognitive and situational factors. These constructions include conjoining, attributive adjectives, sequences of prepositions, hesitations, and inexplicit third person references.

3) In general, the notion that there exists an oral-written dimension influencing language use is tenable, when one considers the unique cognitive constraints on production in each of the two modes. The factors that contribute to and modify this basic oral-written dimension are the situational influences, which affect choices about discourse style. Situational influences act alone, or at least have the strongest effect, in a few cases to influence which constructions are used by a speaker or writer; thus these constructions cannot be said really to differ by mode, although mode and situation are confounded so often that it may appear so. For most of the variables examined, however, cognitive factors broaden or limit a communicator's stylistic choices. Whether any cognitive factor is ever the sole determinant of the distribution of a variable in speech and writing is unclear from the outcome of these studies, though it is possible that vocabulary use, reflected by the outcome for nominalizations, is one such variable.

4) The content of the explanations of basketball produced by subjects in these studies confirms what most researchers in this area have inferred largely from syntactic data alone: that writing is more efficient in communicating ideas per words uttered, whereas speech is more efficient per unit time. The findings for syntax (based on changes under the manipulations explored) do not, however, account for all of the difference in per-word communicative efficiency between speech and writing. It seems likely that part of what is seen as efficiency is a lack of illustrative details and examples. Furthermore, it is probable that the inclusion of such additional information is largely the result of some stylistic demand

characteristic inherent in asking someone to express ideas in a particular mode.

5) In discussing the notion of cognitive constraints, one must be aware of a litero-centric bias. This bias assumes that, regardless of the purpose or mode of the discourse, written structure is always best, though for speakers unattainable. Anyone who has sat through the literal reading of a written paper at a scientific meeting knows the problems that written style can cause for at least the attention, if not indeed the comprehension, of the listening audience. Thus a focus on the differences between, rather than the relative merits of, typical spoken or written linguistic form is more appropriate than a bias toward one type of structure or another.

Notes

[1] Later discussion will include an explication of what constitute typical circumstances of speech and writing and to what extent these circumstance may vary with factors other than mode of production.

[2] Alpha has been arrived at using the Bonferroni adjustment, where alpha = alpha/number of analyses. For this determination of alpha, the MANOVA is counted as one analysis and each other univariate analysis (ideas per 100 words and ideas per unit time) as one each, for a total of three, yielding $.05/3 = .17$.

[3] When I refer here to details, I do not intend to imply that such details make the explanation necessarily better. On the contrary, as Tannen (1989) has noted, details may either help communication or may "work for ill" (p. 161), depending on the goals of communicator and receiver. My scoring system could not distinguish between helpful or useless elaborations on a main point, but one may assume that at least some of the additional information conveyed by speakers may have clarified a point, rather than making understanding more difficult.

APPENDIX A

<u>Definitions of Terms</u>

Definitions and examples come from the authors providing the variables, where possible.

<u>Variable or Term</u>	<u>Definition</u>
adjectival elaborations	modifying nouns with adjectives
adverbial elaborations	modifying verbs or adjectives with adverbs
adverbial expressions	use of adverbs
allness term	extreme or superlative word e.g., none, all, never
attributive adjective	noun or adjective that comes directly before the noun modified instead of in the predicate
auxiliaries or auxiliary verb	also known as helping verbs. Part of compound verb indicating mood and/or tense
colloquial vocabulary	informal vocabulary. e.g., kid, bunch of, figure out
complement clause	clause which follows the verb and completes the idea. e.g., "It is notable <u>that assimilation</u> <u>rules are not much in</u> <u>evidence"</u>
conjoining	use of <u>and</u> to conjoin two elements into a compound phrase. e.g., "...slang for patients reflects responses to their <u>suffering and illness.</u>"
conjunctions	<u>and</u>, <u>but</u>, <u>so</u>, and <u>or</u>
consciousness of projection	words which indicate that the observed is in part a function of the observer. e.g., <u>apparently</u>, <u>to me</u>, <u>seems</u>.
contraction	condensing pair of words or a phrase by use (in writing) of an apostrophe. This shortens the number of syllables to be pronounced or written. e.g., do not ---> <u>don't</u>
coordination	joining together of clauses by <u>and</u>, <u>but</u>, or <u>so</u>. Each clause must contain a subject and a verb.

Variable or term	Definition
dependent clause	a clause which must be used with another clause to form a complete grammatical construction. It depends on the other clause. e.g., <u>When it rains</u>, please bring in the wash.
filler words	category of particles that occur in speech. Because their use is disputed but they often appear together and likely perform similar function(s), they are grouped together in the current investigation. e.g., <u>you know</u>, <u>ok</u>
first person	Nominative case pronoun e.g., <u>I</u>, <u>we</u>, <u>me</u>, <u>us</u>, <u>myself</u>, <u>ourselves</u>.
fuzziness	Hedges or inexact phrases. e.g., <u>and so on</u>, <u>something like</u>, <u>sort of</u>.
gerund	Verb ending in -<u>ing</u>, used as a noun. e.g., <u>Swimming</u> is good exercise.
hedges	expressions which indicate that the choice of words used may not be right. e.g., <u>sort of</u>, <u>kind of</u>
indication of probability	academic hedge which indicates that something is true a certain portion of the time but not necessarily always. e.g., "Correction is <u>usually</u> ..."
inexplicit 3rd person reference	vague use of <u>it</u>, <u>this</u>, or <u>that</u>, in place of a noun, often with no clear antecedent. In the present investigation, only <u>it</u> was counted.
infinitive	the non-conjugated, "to-form" of the verb. e.g., <u>to go</u>, <u>to walk</u>
length of intonation unit	number of words in a unit (in speech) composed of words spoken in a single coherent intonation contour, followed by a pause, and usually a clause. In writing, a "punctuation unit" is considered equivalent because it is assumed that a covert prosody dictates the placement of punctuation.
literary vocabulary	"literary words" as determined by raters. e.g., <u>ascertain</u>, <u>optimal</u>, <u>despite</u>

Variable or term	Definition
modal auxiliary	auxiliary verb indicating the attitude of the speaker toward the state or event expressed by another verb. e.g., <u>should</u> go, <u>might</u> happen
nominalization	noun formed from a verb; eliminates need for a clause based on the verb. e.g., "how people represent space -- > <u>representation</u>
non-finite verbal	non-inflected verb (e.g., infinitive or participle) that cannot serve in a clause
noun clause	a clause which functions as a noun or noun phrase. Can be subject, object, complement, appositive. e.g., <u>What he did</u> is unforgivable.
participle	non-finite verb which functions as an adjective. e.g., A <u>smiling</u> child ...
passive (voice)	A construction which places the direct object in the front of the sentence, changing the emphasis. e.g., active: The doctor prescribed the medicine. passive: The medicine was prescribed by the doctor.
perfective auxiliary	The verb <u>have</u> used with another verb to indicate the tense of a statement. e.g., I <u>have</u> finished. (past tense) He <u>had</u> gone. (past perfect)
preposition	a word which links nouns, pronouns, and gerunds grammatically to the rest of the sentence and which may tell time, direction, case or location. e.g., the roof <u>of</u> the house <u>to</u> the gym
pre-verb length	number of words preceding the verb
pseudo-qualifying terms	"terms loosely indicative of amount or size" e.g., <u>much</u>, <u>many</u>, <u>a lot</u>
qualification	a word which serves "to limit or qualify statements." e.g., <u>if</u>, <u>however</u>, <u>but</u>, <u>except</u>

Variable or term	Definition
relative clause	clause which modifies a noun or noun phrase e.g., "The cognitive constraints <u>which</u> <u>seem to be</u> <u>responsible ...</u>"
self-reference term	first person pronouns or other reference to the self e.g.. <u>I</u>, <u>the author</u>, <u>this writer</u>
sentence length	number of words in a sentence. Definitions of "sentence" vary.
sentence pattern	a measure of the use of words from various categories. Based on the number of times words from a class occur at various positions in the sentence.
series	3 or more items in an idea unit e.g. "No capital letters, definite articles, or plural markers provide clues.
sequences of prepositions	2 or more prepositions strung together. e.g., He talked<u> to the president of thebank.</u>
temporal adverbial	adverbial phrase describing when e.g. "I applied for this post-doc <u>last</u> <u>March.</u>
T-unit length	number of words in a T-unit, which is one independent clause plus any dependent clauses syntactically related to it.
text length	number of words in a text
type-token ratio	ratio of unique words/total words
words of self-reference	words referring to the communicator
you know	utterance common in speech. Its role as a time-filler or other device is disputed

APPENDIX B

<u>Instructions to subjects</u>

(ALL) Imagine that

(Studies 1 and 2) an English-speaking foreigner
(S3: Blatant Spoken) a foreign diplomat
(S3: Blatant Written) an exchange student you know well

(ALL) is about to attend a Duke basketball game for the first time.

(S1 & S2) The person
(S3: BS) The diplomat
(S3: BW) Your friend

(ALL) has never seen the game played and knows nothing about it. Your task is to explain to

(S1 & S2) the person
(S3: BS) the diplomat
(S3: BW) your friend

(ALL) what happens on the court during a game.
        Although time constraints will not allow you to produce a perfect explanation, the perfect explanation would include information about team strategies, likely calls, how the game progresses, and so on, such that

(S1 & S2) the person
(S3: BS) the diplomat
(S3: BW) your friend

(ALL) would know everything necessary to follow the game in detail.

(S1 & S2: Written conditions) You will be writing out your explanation, and you should assume that it is your written explanation that will be given to the person.
(S1 & S2: Spoken conditions) You will be speaking on tape, and you should assume you will tell the person all of this before walking into Cameron.
(S3: BS) You will be speaking on tape, and you should assume that it is your tape that will be sent to the diplomat
(S3: BW) You will be writing out your explanation for your friend now, but you   will hand your friend the explanation before the game.

(S1: Plan Written)   Before you begin your explanation, you will have five minutes' preparation time. Please use this time to organize your thoughts. Write on the preparation sheet anything that will help you prepare to write your explanation. You will be able to refer back to this sheet as you write the explanation. Please do NOT begin writing out the explanation itself until the five minutes are up and I ask you to do so.

To avoid biasing the results of the experiment, I will not be able to answer any questions once the experiment has begun. If you have any questions about what you are to do so far, please ask me now.

The preparation period will begin now.

(S1: Plan Spoken) Before you begin your explanation, you will have five minutes' preparation time. Please use this time to organize your thoughts. You may not make any written notes. Please do not begin telling your explanation until the five minutes are up and I ask you to do so.   To avoid biasing the results of the experiment, I will not be able to answer any questions once the experiment has begun. If you have any questions about what you are to do so far, please ask me now.

The preparation period will begin now.

(all others) (no additional instructions)

(ALL) When I ask you to begin, please

(all Written, except Window) write your explanation on the paper provided. Please do not draw any diagrams or pictures.

(all Spoken) make your explanation into the tape recorder.

(S2: Window) write your explanation on the paper provided within the cardboard sleeve. You will notice that there is only a small slot in which you are able to write. Please write only as many words as will fit in the slot at a time using your normal sized handwriting. Usually this is about five words. When you come to the end of the slot, push the paper through the sleeve so that you cannot see what you have just written, and continue writing as before.

(S1 & S2) (no additional instructions here)

(S3: BS) Please take care to speak in the most written-like manner possible. Speak as if you were writing, so that a transcript of your speech would look like a prepared essay and not like a transcript of spontaneous speech.

(S3: BW) Please take care to write in the most speech-like manner possible. Write as if you were speaking, so that your writing would look like a transcript of spontaneous speech, not like a prepared essay.

(ALL) You will have up to

(S1: 30-minute Spoken; all Written) half an hour
(S1: 5-minute Spoken) five minutes

(all Written)   to write.
(all Spoken)   to speak.

(ALL) You may use all of that time, or as much of it as you need. I will stop you when [thirty or five] minutes are up. Otherwise, please tell me when you have finished.

    To avoid biasing the results of the experiment, I will not be able to answer any questions once the experiment has begun. If you have any questions about what you are to do, please ask me now.

BS: [additional reminder]: Remember, it is extremely important that you pay attention to the style of your speech. Remember to speak as if you were writing, so that a transcript of your speech would look like a prepared essay and not like a transcript of spontaneous speech.

BW: [additional reminder]: Remember, it is extremely important that you pay attention to the style of your writing. Remember to write as if you were speaking, so that your writing would look like a transcript of spontaneous speech, not like a prepared essay.

(ALL) Begin.

APPENDIX C

Samples of speech and writing from the study data

The following are samples from the data I collected in the studies. These come from Study 1, in the
No Plan condition. To show the variation in syntactic structure between modes even where the
expressed content is similar, I have tried to select portions of discourse about the same approximate
topic: how the ball may be advanced in the game in order to score. Other than that constraint, the
passages were not selected deliberately to be extreme examples of either mode's productions. Note,
besides relative fluency, the different feel of the linguistic structure in speech and writing, and how
easily or with what difficulty one can extract what the subject seemed to be trying to express.

Written (No Plan):
The ball is passed back and forth within the team that happens to be in possession of the
ball and, through this team effort, openings are made for a player to successfully shoot
the ball through the hoop. The team not in possession of the ball, meanwhile, tries to
slap the ball away (or "steal") from the other team, thus gaining possession of the ball,
whereupon they will proceed to their hoop and attempt to score for their team.

Spoken (30-minute, No Plan):
Now the what you the way you score a point is you have to the way you score a point is
to advance the ball to the basket or towards it, and the way you advance the ball is to
you can dribble the ball with one hand only. You can't use two hands. Otherwise
you'll you'll lose possession of the ball. That's against the rules, and uh you can pass
the ball up the court anyway really. You can't kick it up. You can only use your
hands. Um then you that's basically how you advance it, and then you can shoot it in.

Spoken (5-minute, No Plan):
Now uh to advance the ball, to move it down the court uh you and your team, and
there's five people on each team, you uh have to dribble the ball, you can't walk with it
and you can't carry it. You have to bounce the ball and uh, as, as opposed to walking
with it and carrying it. And you need to, you need to, you can also pass the ball to
other players on your team and uh there's no restrictions about doing that. So, uh, you
go down the court and your team of five players has to, like I said, get the ball in the
basket and that counts for two points.

APPENDIX D

<u>Post-hoc analyses of interactions</u>

The following is a more extended discussion of the likely meanings of statistically significant interactions for particular variables, based on the results of post-hoc tests. The post-hoc test used was Tukey's HSD, with alpha set at .05.

Study 1

Plan analysis (Plan X Mode Group interaction)

<u>Cognitive variables</u>

Coordination showed an interaction of Mode and Plan. However, Tukey tests of the individual cells in the interaction for coordination reveal that the only differences within Mode Groups according to Plan occur in the five-minute conditions, in which Speakers with no Plan produced fewer, not the predicted more, of these constructions. In fact, the 5-minute No Plan spoken group had fewer instances of coordination than all other spoken groups, which did not differ from each other in amount of coordination. There was no difference in the use of coordination by Plan condition in the two written conditions. The Plan has no immediately obvious interpretable effect on coordination.

Inexplicit third person reference showed a significant interaction of Mode Condition by Plan. Examination by Tukey tests of individual cells in the interaction for differences according to Plan revealed that the only significant difference between spoken conditions occurred between the two 5-minute groups, where, as one would expect, Speakers with No Plan produced more inexplicit third person references than those with a Plan. No difference according to Plan appeared in the 30-Minute Spoken or in the two Written groups.

Adding a planning period apparently makes a difference in the use of inexplicit third person

references only when the total time in which to produce, and the total amount of language to be produced, are low. This could be a simple function of the total time spent speaking, as the end of the entire 5-minute production period is not that far from the planning period and there may still be some advantage to planning even five minutes later. It could also be a function of the ratio of Plan time to production time. As a proportion of the total time to be spent producing language, the planning period was not the same for all Speakers. Speakers in both Plan groups received five minutes to plan, which was one-sixth of the available production time for Speakers in the 30-minute spoken condition and one hundred percent of the available production time for Speakers in the five-minute spoken condition. This ratio of planning time to production time might partly explain the differential effect of Plan on the two spoken groups.

Combination variables

For sequences of prepositions, Tukey tests revealed that the only significant difference according to Plan occurred in the 5-minute spoken conditions, with Speakers with No Plan using significantly fewer sequences of prepositions than Speakers with a Plan. This pattern resembles that for inexplicit third person reference in the cognitive category. As for inexplicit third person references, the differential effect of Plan on the Spoken conditions could be an effect of total time producing or of the ratio of Plan time to production time.

The results for attributive adjectives are less straightforward. Tukey tests on the individual cells for attributive adjectives showed no significant difference by Plan within any Mode Condition. The interaction seems to come from the differences between each of the Written conditions and various Spoken conditions. Written with No Plan has significantly more attributive adjectives than any Spoken group. Written with Plan, on the other hand, has more of these constructions than only the No Plan Spoken groups and has the same number of attributive adjectives as both Spoken groups with Plan. There is no difference between the two Written groups. What this means is difficult to say.

By inspection, if not by robust test outcomes, the Plan spoken groups appear to use more attributive adjectives than the no-Plan spoken groups. Although this is not supported directly by the Tukey tests on differences between Spoken groups, it is at least indirectly supported by the fact that both Written groups have significantly more attributive adjectives than the No-Plan Spoken groups, but only the one written group (No Plan, with the most attributive adjectives of all conditions) has more of these constructions than the Plan Spoken groups (which appear to be in the middle). Such an outcome argues for a rough ordering, in terms of amount of use of attributive adjectives, that puts the two written groups on top, followed by the Spoken with Plan and then Spoken with No Plan. This indirect evidence points to a possible, though minimal, role of Planning (and therefore cognitive factors) in the production of attributive adjectives, particularly by speakers.

Study 3

Interactions of Instructions with Mode

Cognitive variables

A Tukey test on inexplicit third person references revealed that the means for the Blatant conditions are both right in between the two extremes of Regular speech and Regular Writing. Both Spoken conditions (Regular and Blatant) differed significantly from Regular Written, and both Written conditions differed significantly from Regular Spoken. The two Blatant conditions did not differ significantly from one another. This type of interaction leads to the conclusion that the use of inexplicit third person reference is highly influenced by stylistic demands such as the instructions in this experiment. When this information is combined with the finding in Study 1, in which Speakers in the 5-minute Plan condition produced fewer of these constructions than those without a Plan, it begins to appear that inexplicit third person reference belongs in the Combination category.

Situational variables

Tukey tests reveal that, for first person pronouns, the interaction of Instructions by Mode

resulted from the significantly greater number of first person pronouns in regular spoken compared to all other conditions, which failed to differ among themselves. Thus for first person pronouns, it is clearly the action of the Speakers to reduce the use of the pronouns that is driving the interaction. Blatant Speakers managed to reduce their use of first person pronouns enough both to differ from Regular Speakers and to be statistically indistinguishable from Regular Writers. Blatant Writers, on the other hand, did not use enough first person pronouns in their texts to distinguish them from Regular Writers nor to make them appear similar to Regular Speakers.

For contractions, despite a significant interaction of Instructions x Mode, there is no difference within Mode by Instructions. By inspection it appears that Blatant speakers move in the direction of writing by producing fewer contractions while Blatant Writers move in the direction of speech by producing more of them, but the (somewhat conservative) Tukey test fails to find a difference by Instructions. Nevertheless the overall interaction suggests a role for style Instructions which simply cannot be more completely specified here. Perhaps the phonemic process called cliticization, by which words are shortened in speech for the sake of ease of pronunciation, plays a role in the failure of Blatant Speakers to reduce their use of contractions by much, while writers, long trained to eschew contractions from most writing, neglect because of habit to insert them in their 'spoken-like' writing.

Combination variables

For sequences of prepositions, Tukey tests show that Blatant Speakers produce more sequences of prepositions than Regular Speakers, and as many as both groups of writers. Blatant Writers produce few enough sequences of prepositions to be equal in performance to Regular Speakers, but they do not reduce their use of the construction enough to distinguish themselves from Regular Writers. The influence of style instructions is important enough to make each Blatant condition move toward its opposite-mode goal on this variable. Style is an important determiner of the use of sequences of prepositions. Note that, again, it is largely the behavior of the Blatant

Speakers (imitating writers) that drives the interaction, as they approach the values produced by Writers while differing significantly from Speakers.

The pattern for attributive adjectives was similar to that for first person pronouns (see the results for first person pronouns under situational variables), with the exception that, because attributive adjectives are more, rather than less, common in writing than in speech, the effect was in the opposite direction of that for first person pronouns. Texts from the Regular spoken condition have fewer attributive adjectives than texts from each of the other conditions, which do not differ significantly from each other. Again style is an important influence on the distribution of a combination variable.

For hesitations, all conditions except Blatant Written and Regular Written were significantly different from each other by Tukey test. It is clear that stylistic factors in the form of the Instructions in this experiment play a role in the distribution of hesitations. Not only did one Blatant Writers use hesitations (though this was not enough to differentiate the two groups of Writers statistically), but Blatant Speakers removed enough of these sounds from their speech to make a statistical difference compared to Regular Spoken. Stylistic concerns make a difference in the behavior of speakers and writers trying to produce adequate language in the mode of interest.

APPENDIX E

Future studies

The dissertation work described here is in some senses just a work in progress. Based solely on the theoretical background regarding mode differences and their relation to cognition and situations, there are many other studies that suggest themselves, and some of those are underway already, while others are planned. Furthermore, the results suggest directions for future research to elaborate on what has been found. The following are some of the studies planned and/or underway.

Studies nearing completion

Speed. One of the factors that is part of the cognitive aspects of speech and writing and was left out of the dissertation work is the difference in speed between the two modes. Speakers produce language on average six times as fast as writers, and at least three times as fast as typists. That means that all the tasks attendant to producing language must occur faster in speech than in writing. And, inseparable from the speed of production in natural speech is the need for continuous production, whether to hold the floor in front of an audience, or out of the habit of not allowing long silences.

To assess the contribution of the factors of speed and enforced continuous production, I have collected data from 40 subjects, who typed their explanations of basketball into a computer program. The idea was to make writing as similar to speech as possible in the speed and the continuous production dimensions. Additionally, to avoid the problems of correcting on the typing program (how was one to handle corrections, which crop up more with typographical errors than in handwriting?), no one was able to correct, as the backspace and arrow keys were disabled (all subjects were told to ignore typographical errors, or if they felt compelled to "fix" grammatical or lexical errors, to do so by typing the correct word or phrase after the original or when it occurred to them to do so. Generally there were few grammatical or lexical corrections in the original writing conditions, so this should not be much of a problem for the typists, either).

Twenty of the subjects typed with instructions simply to be as quick as they could, while the other twenty were told the same, and additionally, warned that long pauses ($\geq$ 1 second) would cause a beep from the computer that could only be silenced by continuing to type. To silence the beep, they could type more prose, or hit the backslash or forward slash keys while thinking (which we would later score as equivalent to saying "um" in speech).

These two conditions will be compared to the same baseline speech and writing conditions used in the dissertation, with a logic similar to that of the window experiment. Baseline writing and speech are on either end of a necessarily-confounded speed and continuous-production continuum. In between are the No-beep typists (close to the writers because they only increase the speed of production and do not add the continuous-production constraint) and the Beep Typists (close to the speakers because of increased speed as well as enforced continuous production). Each of the two manipulations in the typing part of the experiment is intended to make conditions one step closer to that of speech.

Analysis. Analysis will be carried out in a way similar to that in Study 2 of the dissertation. Planned contrasts will be used to compare theoretically adjacent conditions (Writers to No-Beep Typists; No-Beep Typists to Beep Typists; Beep Typists to Speakers).

Predictions. Speed and its usually concomitant demands of continuous output for speakers should constitute cognitive manipulations. Therefore, like the first two studies in the dissertation, I expect the manipulations to affect, on the whole, the Cognitive and Combination variables. The slashes in the Beep group will be counted, conservatively, as hesitations, with each group of such slashes (rather than each individual slash) measured as one "um." So there is a measure of hesitations and of how they are affected by enforced continuous production. In general, as we move from writing to speech, through the two typing conditions, the patterns of the variables should resemble writing less and speech more.

Topic difficulty. Another way to look at the effects of cognitive load on speech and writing is to

vary the topic from easy to difficult, as assessed by some objective measure. The topic of basketball was intended to be relatively difficult, exaggerating any cognitive processing effect differences between speech and writing, because the topic is non-linear in organization. It is difficult to predict the order in which people will produce various aspects of the game of basketball because there is no underlying temporal or other structure that acts to determine a logical order. An informal look at the raw data from the dissertation will confirm this lack of any common pre-determined order of discussion. Because speech and writing are necessarily linear, and the topic of basketball is not, putting ideas in a linear order for production was expected to maximize cognitive processing load. (The cognitive processing effects of ease of linearization have been documented before, e.g., Levelt, 1989).

On the other hand, a topic with a pre-determined linear structure should be easier to organize for production, and thus should cause fewer demands on cognitive processing, leaving more resources available for the production of particular grammatical structures (and the avoidance of others), particularly in speech.

Therefore, I asked a group of subjects to describe everything that happens when a person goes out to dinner and a movie with friends. The linear order and regularity of responses to both parts of this topic have already been described by script theorists (e.g., Bower, Black & Turner, 1979), so the underlying structure and typical content of this topic are known beforehand.

Analysis

The baseline groups for comparison are the same as in the dissertation. The logic for this study is like that of the Plan manipulation in Study 1 of the dissertation. Assuming cognitive processing capacity affects the use of certain constructions (which we now know it does, to some extent), then speech with a linear topic should look more like writing, or less like speech, than it does with the non-linear topic of basketball, on such variables as hesitations. The 30-minute spoken groups will be dropped, so this study can be analyzed as a 2 (Mode) x 2 (Topic linearity) ANOVA.

Predictions

The combination variables should change, based on the cognitive consequences of a more linear topic. I predict two main effects: Mode, of course, and Linearity, with the more linear topic promoting more use of written features and, potentially, less use of oral features (assuming subjects share a a litero-centric bias and would try to reduce many oral features given reduced cognitive load).

Perhaps the values for passive voice and nominalizations will change with this manipulation (relative to their values in the basketball version), given the change in topic.

Analyses planned

. The data from the dissertation studies constitute, as one committee member once said, a "gold mine of data" to use for additional analyses. Here is one such future analysis.

Content and its structure. The content analyses done in the dissertation were a necessarily gross first step toward understanding what kinds of concepts subjects were likely to talk about in the course of describing the game of basketball. But these first analyses leave much work yet to be done.

For example, one thing the preliminary analysis of content could not do was show what the typical structure of basketball descriptions was like. Do subjects always start with the same basic information, or does it vary? How do subjects organize their descriptions? And are there mode differences (i.e., demand characteristics) in the order and structure of their descriptions of aspects of the game? Do manipulations like Planning or particular style instructions affect this structure?

No work has been done at all in this area, as far as I can tell. Much work has been done on story structure as a way of understanding comprehension of and memory for narrative as well as autobiographical memory. Reams have been published on subjective organization in the recall of verbal learning lists. But nothing has been done to look at the organization of the content of discourse during production.

There are no hypotheses or specific theories out there yet regarding the structure of the

content of discourse, so this work will be descriptive at first. I intend to explore the frequency with which particular elements or classes of elements are mentioned in the explanation of basketball, as well as the order in which they are produced. I do not know what I will find, although by comparing the basketball data to the "going to a restaurant" data, I expect to find that the presence or absence of a linear script makes a difference in how people explain a phenomenon.

The task of explaining the game of basketball (or any other topic, for that matter) is, after all, partly a language production task and partly a semantic memory task. There may even be autobiographical components to memory for the game of basketball as subjects recall particular games while describing the sport. I want to explore how these "separate" components work together. Here are two ways to get at the organization of discourse.

Unit analysis. I intend to look at the organization of content in two ways, to start. One is a unit analysis, which can be done by dividing the content of my two baseline written and spoken conditions into idea units (unlike my other content scoring, which pre-determined the content to look for by using the NCAA rule book as the basis for what ideas were of interest), and noting the order in which particular ideas appear as well as the frequency of specific ideas. The same analysis can be done with the data from the "going to a restaurant" study, and comparisons can be made.

Individual outlines. Another way to get at questions about the organization of subjects' explanations of basketball is to make an outline of the content for each subject and to compare those outlines. Particular sub-topics that go together may become obvious, and there may be some gross-level similarities in what is discussed, regardless of detail (e.g., do people always mention team size and number of teams?).

Outlines can also be done with the data from the "going to a restaurant" study, and comparisons can be made.

Qualitative comparison of one speaker to one writer

Acting more like a linguist than a psychologist, I may also take one speaker and one writer

from the basketball corpus and use those data to illustrate both the syntactic and the content findings that I have described in the dissertation. Giving examples of individual constructions the way I have done in Appendix A is fine, but one cannot get a true taste for what the phenomenon of oral-written differences is like without looking at some larger segments, preferably dealing with the same sub-topic.

This work is qualitative, but backed up by my quantitative results. I hope it will give interested readers a better sense for how real speech (not fictional dialogue) looks when compared to real first-pass writing (not word-processed, expert-produced, literate, written prose).

<div align="center">Other possible studies</div>

I mentioned before that the studies in this dissertation were not designed to speak to the issue of audience effects on speech and writing. Such a study would evaluate the extent to which speaker/writer expectations about listener/reader abilities affect language production. It would be possible to look at such effects through manipulations of the basic instructions of my studies. For example, one could ask subjects to write an explanation that would be read aloud to the foreign visitor vs. a native English speaking expert on basketball (in contrast to writing like speech as in Study 3) or to speak with the purpose of making a typed transcript for the foreign visitor vs. a native English speaking expert on basketball.

Notes, planning, representation, and production.

In the Plan condition of Study 1, subjects in the written condition could write notes and refer to them during production, whereas speakers could only plan mentally. As a further examination of the effects of cognitive constraints on speech and writing, one could employ a 2 X 2 design, allowing both speakers and writers a planning period with or without notes. The effect of notes should be greatest on speakers.

A second possibility is based on a suggestion by Day (1980) that the type of note structure used may have effects on speaker fluency. Day has suggested that there may be advantages to

certain types of note structure (e.g., tree diagrams) versus others (e.g., lists of points). One could

assign note-making speakers and writers, in a 2 (mode) X 3 (note type) design, for example, to make

their notes in the most or least efficient ways (e.g., as trees, outlines, or lists), evaluating the effects

of this type of cognitive aid on speech and writing. One would expect the largest effects on

speakers.

REFERENCES

Beaman, K. (1984) Coordination and subordination revisited: Syntactic complexity in spoken and written narrative discourse. In D. Tannen (Ed.) *Coherence in spoken and written discourse* (pp. 45-80). Norwood, New Jersey: Ablex.

Beattie, G. W. (1980) The role of language production processes in the organization of behaviour in face-to-face interaction. In B. Butterworth (Ed.) *Language production Vol. 1: Speech and talk* (pp. 69-107). London: Academic Press.

Biber, Douglas. (1986) Spoken and written textual dimensions n English: Resolving the contradictory findings. *Language, 62*, 384-414.

Blankenship, J. (1962) A linguistic analysis of oral and written style. *Quarterly Journal of Speech, 48*, 419-422.

Bower, G. H., Black, J. B., & Turner, T. J. (1979) Scripts in memory for text. *Cognitive Psychology, 11*, 177-220.

Butterworth, B. (1975) Hesitation and semantic planning in speech. *Journal of Psycholinguistic Research, 4*, 75-87.

Butterworth, B. (1980) Evidence from pauses in speech. In B. Butterworth (Ed.) *Language production Vol. 1: Speech and talk* (pp. 155-175). London: Academic Press.

Caramazza, A. (1988) Some aspects of language processing revealed through the analysis of acquired aphasia: The lexical system. *Annual Review of Neurosciences, 11*, 395-421.

Caramazza, A. & Hillis, A. E. (1990) Where do semantic errors come from? *Cortex, 26*, 95-122.

Chafe, W. (1982) Integration and involvement in speaking, writing and oral literature. In Deborah Tannen (Ed.) *Spoken and written language: Exploring orality and literacy* (pp. 35-53). Norwood, New Jersey: Ablex.

Chafe, W. & Danielowicz, J. (1987) Properties of spoken and written language. In R. Horowitz and S.J. Samuels (Eds.) *Comprehending oral and written language* (pp. 83-113). New York: Academic Press.

Chafe, W. & Tannen, D. (1987) The relation between written and spoken language. *Annual Review of Anthropology, 16*, 383-407.

Day, R. S. (1980) Teaching from notes: Some cognitive consequences. In W. J. McKeachie (Ed.) *New directions for teaching and learning: Learning, cognition, and college teaching*. San Francisco: Jossey-Bass.

DeVito, J. A. (1966) Psychogrammatical factors in oral and written discourse by skilled communicators. *Speech Monographs, 33*, 73-76.

Drieman, G. H. J. (1962) Differences between written and spoken language: An exploratory study, I: Quantitative approach. *Acta Psychologica, 20*, 78-100.

Drieman, G. H. J. (1962) Differences between written and spoken language: An exploratory study, II: Qualitative approach. *Acta Psychologica, 20*, 36-77.

Erman, B. (1986) Some pragmatic expressions in English conversation. In G. Tottie & I. Baecklund (Eds.) *English in speech and writing: A symposium* (pp. 131-147). Uppsala, Sweden: Almqvist and Wiksell International.

Gibson, J.W., Gruner, C.R., Kibler, R.J. & Kelly, F.J. (1944) A quantitative examination of differences and similarities in written and spoken messages. *Speech Monographs, 33*, 444- 454.

Goldman-Eisler, F. (1961) Hesitation and information in speech. In C. Cherry (Ed.) *Information theory* (pp. 162-174). London: Butterworth.

Goldman-Eisler, F. (1967) Sequential temporal patterns and cognitive processes in speech. *Language and Speech, 10*, 122-132.

Goldman-Eisler, F. (1968) *Psycholinguistics: Experiments in spontaneous speech*. London: Academic Press.

Harwood, F.W. (1959) Quantitative study of the speech of Australian children. *Language and Speech, 2*, 236-271.

Higgins, E.T. (1978) Written communication as functional literacy: A developmental comparison of oral and written communication. In R. Beach & R. D. Pearson (Eds.) *Perspective on literacy: Proceedings of the 1977 perspectives on literacy conference* (pp. 91-118). University of Minnesota: College of Education.

Horowitz, M. W. & Berkowitz, A. (1964) Structural advantage of the mechanism of spoken expression as a factor in differences in spoken and written expression. *Perceptual and Motor Skills, 19*, 619-625.

Horowitz, M. W. & Newman J. B. (1964) Spoken and written expression: An experimental analysis. *Journal of Abnormal and Social Psychology, 68*, 640-647.

Lakoff, R. (1975) *Language and woman's place*. New York: Harper and Row.

Levelt, W. J. M. (1989) *Speaking: From intention to articulation*. Cambridge, Massachusetts: The MIT Press.

Matsuhashi, A. (1981) Pausing and planning: The tempo of written discourse production. *Research in the Teaching of English, 15*, 113-134.

Miller, G. (1962) Some psychological studies of grammar. *American Psychologist, 17*, 748-762.

Morton, J. & Patterson, K. E. (1980) A new attempt at an interpretation, or an attempt at a new interpretation. In J. Coltheart, K. E. Patterson, & J. C. Marshall (Eds.) *Deep Dyslexia* (pp. 91-118). London: Routledge and Kegan Paul.

O'Donnel, R. C. (1974) Syntactic differences between speech and writing. *American Speech, 49*, 102-110.

Poole, M.E. & Field, T.W. (1976) A comparison of oral and written code elaboration. *Language and Speech, 19*, 305-312.

Portnoy, S. (1973) A comparison of oral and written verbal behavior. In K. Salzinger & R. S. Feldman (Eds.) *Studies in verbal behavior: An empirical approach* (pp. 99-151). New York: Pergamon Press, Inc.

Redeker, G. (1984) On differences between spoken and written language. *Discourse Processes, 7*, 43-55.

Rothkopf, E.Z. (1971) Incidental memory for location of information in text. *Journal of Verbal Learning and Verbal Behavior, 10*, 608-613.

Rubin, A. (1980) A theoretical taxonomy of the differences between oral and written language. In R. J. Spiro, B. C. Bruce & W. F. Brewer (Eds.) *Theoretical issues in reading comprehension* (pp. 411-438). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Tannen, D. (1982) Oral and literate strategies in spoken and written narratives. *Language, 58*, 1-22.

Tannen, D. (1983) Oral and literate strategies in spoken and written discourse. In R.W. Bailey & R. M. Fosheim (Eds.) *Literacy for life: The demand for reading and writing* (pp. 79-96). New York: The Modern Language Association.

Tannen, D. (1984) *Conversational style: Analyzing talk among friends*. Norwood, New Jersey: Ablex Publishing Company.

Tannen, D. (1985) Silence: Anything but. In D. Tannen & M. Saville-Troike (Eds.)*Perspectives on silence* (pp. 93-111). Norwood, New Jersey: Ablex Publishing Company.

Tannen, D. (1989) *Talking voices: Repetition, dialogue, and imagery in conversational discourse.* New York: Cambridge University Press.

Zechmeister, E.B. & McKillip, J. (1972) Recall of place on the page. *Journal of Educational Psychology*, *63*, 446-453.

Zechmeister, E.B., McKillip, J., Pasco, S. & Bespalec, D. (1975) Visual memory for place on the page. *Journal of General Psychology*, *91*, 43-52.

BIOGRAPHY

Kirsten Nielsen was born on May 6, 1965, in Wiesbaden, West Germany. She received her Bachelor of Science in Psychology with High Honors from the University of Florida in 1987 and began her graduate training at Duke University later that year. Her honors include the William McDougall Graduate Fellowship, a visiting fellowship from the Danish Research Academy, and the Edna S. Bissette Dissertation Fellowship.